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**NON-TIME-CRITICAL REMOVAL ACTION WORK
PLAN**

**OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO**

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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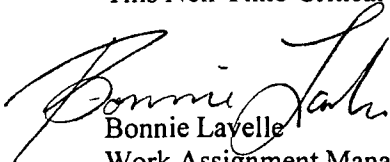
Vasquez Boulevard/Interstate 70 Superfund Site
Operable Unit 1
Non-Time-Critical Removal Action Work Plan

**VASQUEZ BOULEVARD/INTERSTATE 70 SUPERFUND SITE
NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN**

This work plan has been prepared at the request of the U.S. Environmental Protection Agency (USEPA), Region 8, by MFG, Inc. and Tetra Tech EM Inc. to address removal activities in the residential portion of the Vasquez Boulevard / Interstate 70 Superfund Site in Denver, Colorado.

TITLE AND APPROVAL SHEET

This Non-Time-Critical Removal Action Work Plan is approved by USEPA without conditions.


Bonnie Layelle
Work Assignment Manager
U.S. Environmental Protection Agency


 14, 2003
Date

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
ASARCO	American Smelting and Refining Company
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
CDOT	Colorado Department of Transportation
CRS	Colorado Revised Statutes
NPL	National Priorities List
OU	Operable Unit
RI	Remedial Investigation
ROD	Record of Decision
TCLP	Toxicity Characterization Leaching Procedure
USEPA	United States Environmental Protection Agency
VB/I70	Vasquez Boulevard and Interstate 70

1.0 INTRODUCTION

This document presents the design for a non-time-critical removal action the Off-Facility Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site located in Denver, Colorado. The purpose of this work plan is to present the design details of measures to implement soil removal and replacement for lead and arsenic contaminated soils with concentrations above removal action levels in residential yards within the VB/I70 Site. The requirements for this action are set out in the U.S. Environmental Protection Agency's (USEPA's) Non-Time-Critical Removal Action Memorandum (USEPA, 2003).

1.1 Site Description

The VB/I70 site covers an area of approximately four square miles in north-central Denver, Colorado (see Figure 1-1). For the purpose of investigation and remediation, the site has been divided into three operable units (OUs). The residential soils discussed in this report are known as the Off-Facility Soils Operable Unit 1 (OU1) portion of the site. The locations of the former Omaha & Grant Smelter and Argo Smelter are identified as On-Facility Soils OU2 and OU3, respectively. The site is composed of a number of neighborhoods that are largely residential, including Swansea/Elyria, Clayton, Cole, and portions of Globeville. Most residences at the site are single-family dwellings, but there are also some multi-family homes and apartment buildings. There are approximately 4,000 residential properties within the site boundaries. The site also contains a number of schools, parks, and playgrounds, as well as commercial and industrial properties.

1.2 Report Organization

Site-specific factors that form the basis of the removal action, including the properties to be remediated, the planned measures to address flowerbed and gardens in yards scheduled for removal, requirements for clean replacement materials, and options for disposing of the excavated materials are discussed in Section 2.0. The removal action design is presented in Section 3.0. Specific details regarding procedures and practices to be followed during removal action construction are described in Section 4.0, and additional construction-related considerations are identified in Section 5.0. Project reporting requirements are identified in Section 6.0.

2.0 BASIS OF DESIGN

This section presents a summary of previous sampling results and associated technical analyses that form the basis of the removal action design.

2.1 Candidate Properties for Soil Removal

Extensive soil sampling of the majority of the residential areas was conducted during the Phase III Investigation in 1999 and 2000. The results of the investigation were reported in the RI report (Washington Group, 2001), which was issued in final form in July 2001. Data from the investigation were used to calculate arsenic and lead exposure point concentrations for each yard. These exposure point concentrations were compared with the residential soil removal action levels established by USEPA in the Non-Time-Critical Removal Action Memorandum (USEPA, 2003) of 240 mg/Kg arsenic and 540 mg/Kg lead to identify properties with yard soils concentration which equaled or exceeded the action levels. Based on this analysis the removal action will target 141 properties, as identified in Appendix A. Additional properties will be remediated once remedial action levels are defined by EPA in the Record of Decision.

2.2 Gardens and Flowerbeds

During soil removal activities, residents are often reluctant to allow gardens and flowerbeds to be removed. Based on an understanding of site conditions, as described in the RI report (Washington Group, 2001), it is likely that gardens and flowerbeds will typically have lower arsenic and lead concentrations than other areas of the yard.

As described in Section 4.0, the scope of soil removal activities at a given property will be agreed upon with the property owner prior to remediation. At the initial meeting with the property owner, USEPA's designated representative during construction (hereafter termed "Supervising Contractor") will, among other things, identify gardens and flowerbeds that the owner would prefer to keep.

Soil samples will be collected from each vegetable garden/flowerbed area identified by the owner. The soil samples will be analyzed for arsenic and lead, and the sample results will be compared to the Site remedial action levels. Gardens/flowerbeds with arsenic concentrations greater than or equal to

70 mg/kg and/or lead concentrations greater than 400 mg/kg will be recommended to the property owner for removal and replacement. Gardens/flowerbeds with soil concentrations below 70 mg/kg arsenic or equal to or below 400 mg/kg lead will be left in-place.

Details of the garden and flowerbed sampling program are discussed in Section 4.3.

2.3 Clean Replacement Material

Excavations will be backfilled and restored in kind with clean replacement materials. Clean replacement material will have contaminant concentrations less than or equal to the values listed on Table 2-1. In addition, the replacement soil will have properties that are appropriate for their intended use. For example, replacement soils will have properties that promote plant growth and provide suitable drainage, while replacement gravel for unpaved driveways and parking areas will have appropriate gradation.

Specific textural requirements for the replacement soil will be established by the Supervising Contractor and approved by USEPA prior to beginning construction according to the following procedure.

- Representative soil samples will be collected from 10 yards targeted for removal activities. To provide for the results to be representative of the site, samples will be collected as follows: 3 from the Cole neighborhood; 3 from the Clayton neighborhood; 1 from the Elyria neighborhood; and 3 from the Swansea neighborhood (at least one from north and south of I-70). Within each neighborhood, the Supervising Contractor will select properties that are spatially distant from each other to provide data across the site.
- The soil samples will be analyzed for clay, silt and sand composition according to American Society for Testing and Materials (ASTM) Method D-422, or another suitable method.
- The Supervising Contractor will plot the results of these analyses on a textural triangle, such as the one shown on Figure 2-1, and apply professional judgment to select acceptable limits for clay, silt and sand content in the replacement soil based on the existing soil composition data.
- USEPA will review and either approve or modify the Supervising Contractor's recommended soil composition limits.

Details regarding collection and analysis of the existing yard soils to support evaluation of the replacement soil composition requirements are described in the Construction Quality Assurance Plan (Appendix F).

2.4 Disposal of Excavated Materials

Excavated materials will be transported off-site for disposal. Disposal options for these materials include a number of regional solid and hazardous waste disposal facilities. Another potential option for non-hazardous materials is to relocate the materials to the nearby American Smelting and Refining Company, Inc. (ASARCO) Globe Plant, where they could be managed in conjunction with materials from other local residential soil remediation actions (i.e., the South Globeville Residential Soil Remediation Project) and site closure plans. Disposal at the ASARCO Globe Plant would be contingent on an agreement between ASARCO and USEPA prior to soil excavation activities.

USEPA will further evaluate alternatives for managing the materials and will select a management alternative prior to Construction Contractor mobilization.

Time-critical removal actions were performed in 1998 and 2001, which addressed yards with higher arsenic and lead concentrations than the properties to be addressed in this non-time-critical removal action. Soil excavated during these actions was disposed as solid waste, indicating the excavated materials were not toxicity characteristic hazardous waste (URS, 1999). Therefore, based on the prior removal action activities, it is not anticipated that the excavated materials will require management as hazardous waste. However, in-place soil samples will be collected from the yards scheduled for removal to confirm this belief. These waste characterization samples will be collected in-situ prior to soil excavation, as described in Section 4.3.3. The samples will be analyzed to measure the concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents in sample leachate to support classifying the materials as solid waste. USEPA will consider these data when selecting the designated disposal location(s) and methods for the yard materials, and the final disposal locations will be identified prior to beginning removal action construction.

3.0 REMOVAL ACTION DESIGN

This section presents the Off-Facility Soil Operable Unit removal action program design. Specific details regarding implementation of the design are discussed in Section 4.0. Construction Technical Specifications are provided in Appendix G.

3.1 General Removal Action Design

Removal actions will be performed at each of the candidate properties listed in Appendix A. Specific details of the overall removal action sequencing (i.e., the order which properties and neighborhoods will be targeted) will be identified in a Construction Sequence Plan, to be prepared by the Supervising Contractor prior to construction, and approved by USEPA, as described in Section 5.1.

The properties will be remediated by excavating and removing accessible surface soils to a depth of 12 inches. Accessible excavation areas mean grass-covered and bare yard areas, gravel-covered driveways and parking areas, flower gardens and vegetable gardens (except where exempted based on pre-removal action sampling) and beneath sheds that may be moved without causing structural damage to them. Excavation will not be performed in areas that are covered by brick or pavement surfaces (such as concrete pads, patios, paths, and driveways); areas where permanent structures are present (such as houses, garages and crawl spaces); or areas covered by large landscaping items (such as retaining walls, water features, etc.).

Soil will be excavated to a depth of 4 inches and removed from beneath decks that are located 18 inches or higher above the ground surface. Soil will not be excavated from beneath decks lower than 18 inches.

Soil removal will also be performed in road apron areas (soil areas between sidewalks and streets) adjacent to properties being remediated. Access to these areas will be obtained from the City of Denver before beginning removals.

The removed soils will be loaded into trucks and transported to either a municipal solid or hazardous waste disposal facility or the ASARCO Globe Plant; soils are expected to be non-hazardous based on existing site data, however, sampling will be performed as part of the removal action to verify

this (see Section 4.3.3). USEPA will select the disposal location prior to Construction Contractor mobilization based on the results of the pre-removal action waste characterization program and discussions with ASARCO.

Excavation areas will be backfilled and restored in kind with clean replacement materials. At a minimum, excavated yards, gardens and flowerbeds will be restored with 12 inches of soil that meets the USEPA approved replacement soil composition. Excavated driveway and parking areas will be restored with 8 inches of compacted soil and 4 inches of gravel. All replacement materials will meet the replacement material chemical criteria specified in Table 2-1. Replacement soil will also have properties that promote plant growth and provide suitable drainage. Specific requirements for replacement soil composition will be developed as described in Section 2.3. Replacement gravel will meet the CDOT requirements for Type IV cover coat aggregate.

Following backfill, the fill areas will be restored in a manner that reasonably approximates original conditions. For example, excavated flowerbeds will be replaced and finished with comparable plants and vegetation. Areas previously covered by grass will be re-vegetated with grass or other replacement material acceptable to the owner as necessary to achieve the project requirements for reducing grassed areas as discussed in the next paragraph. Produce gardens will not be replanted. USEPA may provide garden center vouchers to the property owner to cover the costs of replacing flower gardens if the existing plants cannot be replaced during the current planting season. Decorative gravels, mulch and other landscape finishes will be installed in bare soil areas and as necessary to reasonably restore the yards to near original condition. To facilitate the restoration process, the Supervising Contractor will develop a menu of available replacement materials and will work with the property owner to develop a plan for restoring the property. During restoration, any fences or land survey monuments disturbed by the excavation will be replaced and restored. In light of Denver's current drought situation, special procedures will be necessary during property restoration to minimize water usage. These procedures will include minimizing the use of high water consumption replacement plants, reducing the total area of grass on the property, implementing work practices that emphasize dry clean-up rather than use of water sprays, and strategic watering of replacement vegetation. In addition, a special use permit from the Denver Water Board may be required so that the project may be performed. Further details of the project water conservation measures and Denver Water Board requirements are described in the project Water Conservation/Management Plan, included in Appendix C.

The USEPA will maintain the replacement vegetation after the property restoration is completed. Restored properties will be maintained for a period of thirty days following restoration. The maintenance will consist of watering and organic fertilizing the replacement vegetation, but will not include mowing. Maintenance will be performed within the typical growing season from late March through early October.

3.2 Property-Specific Design Considerations

Specific removal action details will be developed on a property-by-property basis. Individual Site Remediation Maps (an example is shown as Figure 3-1) will be prepared for each property to identify the soil removal areas and associated excavation or restoration requirements. Draft Site Remediation Maps will be prepared and reviewed with the property owner during a pre-excavation property inspection. If requested by the owner, sampling of gardens and flowerbeds will be scheduled at this time. After the inspection and sample analysis, the Site Remediation Maps will be revised to incorporate the property owner input and determinations regarding the need to remove any gardens and/or flowerbeds based on the sampling results.

Once the Site Remediation Map has been finalized, the property owners will also be asked to authorize the removal actions by signing the Site Remediation Map. The property owner's signature on the Site Remediation Map will be required before any removal activities can begin on their property.

Upon completion of a removal action at a particular property, yard maintenance will be performed as described in Section 3.1. Once the maintenance period is completed, any repairs are completed, and all disputes associated with the soil removal/replacement activities are resolved at a property, the Supervising Contractor, will inspect the property with the owners. Following this inspection, the property owner will be asked to sign an as-built Site Remediation Map, attesting that the work performed meets their satisfaction. The as-built Site Remediation Map will document the areas where soil was removed and restored on the property. As such, the as-built Site Remediation Maps will be the principal means of documenting that the objectives of the removal action have been attained.

After the removal action construction and maintenance periods have been completed on a particular property, USEPA will issue a letter to the owner to document that the property has been remediated. An example of the Property Removal Action Completion letter is included in Appendix B. A copy of the final as-built Site Remediation Map, signed by the property owner, Supervising Contractor and USEPA, will be appended to each letter.

3.3 City Property Design Considerations

For many residential properties, the “yard” includes a small strip of grass-covered or bare soil located between the sidewalks and the street. These areas, termed “road aprons”, are typically owned by the City of Denver, but are perceived by the property owner to be part of the yard and, in many cases, have been maintained by the property owner in conjunction with the yard.

Because these road aprons are effectively part of the yard exposure unit, and were sampled during the RI, they will be remediated along with the adjacent yard. The individual Site Remediation Maps will identify the removal actions that will be performed on the adjacent road aprons. To facilitate this process, USEPA will meet with the City of Denver to discuss the project and request a blanket authorization for road apron removal actions. Based on the State’s recent experience with similar yard remediation efforts at Globeville, it is anticipated that the City will require installation of a non-vegetative covering for the road apron areas to minimize on-going water usage and maintenance requirements. Further details of possible alternative cover materials are discussed in the Water Management Plan (Appendix C). Final removal action and restoration requirements for City-owned property areas will be identified during future discussions between USEPA and the City.

4.0 REMOVAL ACTION CONSTRUCTION

This section describes the construction procedures necessary to implement the removal action design described above. Excavation activities will be planned to minimize physical and chemical hazards to workers and residents. Work practices will include the use of sound safety measures, operating heavy equipment in a safe manner, and performing actions at each property quickly and effectively to reduce the extent of disturbances to residents and the general public.

4.1 Project Team Roles

The removal action project team will consist of the USEPA, a Supervising Contractor, a Construction Contractor and its subcontractors. The USEPA is the lead agency and will be responsible for overall project implementation. USEPA will select a Supervising Contractor or Contractors that will support USEPA by managing the Construction Contractor and performing field oversight and quality assurance activities. The Construction Contractor will serve as general contractor for the project and will be experienced in removal action projects of this type. The Construction Contractor will hire specialty subcontractors (e.g., transporters, landscapers, etc.) as necessary to complete the project. The property owners will provide access to the affected properties, review and approve the construction activities on their property and confirm that the work has been satisfactorily completed. Section 4.2 provides an overview of the interactions between project team members associated with property sampling and removal action activities and property owners.

4.2 Access Agreements and Property Owner Authorizations

This section provides a description of the access agreement and property owner authorization required for sampling and remediation of each property.

Property owner authorization, in the form of a signed access agreement, will be required before any pre-removal action sampling or removal action activities can begin on a property. Property owners must agree to the full remediation of their property. Partial remediation will not be performed. The Supervising Contractor, on behalf of USEPA, will perform the initial contact with the property owner and schedule a meeting. At this meeting, the Supervising Contractor will explain that the property is a candidate for removal action, the nature of the action and that the owner may elect to save gardens and

flowerbeds if sampling determines that lead and arsenic concentrations are below 400 mg/kg and 70 mg/kg, respectively. The Supervising Contractor will then request the property owner sign an access agreement (see Appendix B). Once the Access Agreement has been signed, the Supervising Contractor will work with the property owner to develop the draft Site Remediation Map. If the owner does not wish to save any gardens or flowerbeds, the Site Remediation Map will be finalized. If the property owner does elect to try to save certain gardens or flowerbeds, sampling will proceed as described in Section 4.3.1 and the sample results will be incorporated into the final Site Remediation Map.

Each property owner will have an opportunity to review and will be required to approve the Site Remediation Map for their property before removal action activities begin. After property remediation and maintenance has been performed, USEPA, the Supervising Contractor and the property owner will sign an as-built version of the Site Remediation Map to document that the work has been satisfactorily completed, and USEPA will issue a letter to the property owner certifying that the property has been remediated.

The typical sequence of reviews and approvals associated with property remediation are listed on Table 4-1. As indicated, the Supervising Contractor will lead all interactions with the property owners. The Construction Contractor will support the Supervising Contractor as indicated. USEPA will review and approve the final Site Remediation Maps.

4.3 Supplemental Sampling

This section includes a description of supplemental sampling in yards, gardens and flowerbeds and disposal characterization sampling and analyses.

4.3.1 Garden and Flowerbed Sampling

If a property owner expresses a wish to save gardens or flowerbeds, the Supervising Contractor will collect soil samples from the identified gardens and flowerbeds area. All of the garden and flowerbed samples will be analyzed for arsenic and lead. Based on the sampling results, gardens and flowerbeds with soil arsenic concentrations greater than or equal to 70 mg/kg and/or lead concentrations greater than 400 mg/kg will be remediated, while those with lower soil concentrations will not be remediated. These results will be incorporated into the final Site Remediation Plan and approved by the property owner before property remediation begins.

Further details of the garden and flowerbed sampling and analysis procedures are described in Section 4.0 of the Construction Quality Assurance Plan, which is included in Appendix F.

4.3.2 Yard Soil Composition Sampling

Prior to beginning construction, the Supervising Contractor will collect and analyze soil samples from a subset of the yards scheduled for clean up. These samples will be analyzed for clay, silt and sand composition. The results of these analyses will be used in establishing specific textural requirements for the replacement yard soil, as described in Section 2.3. Details of the yard composition sampling procedures are described in the Construction Quality Assurance Plan in Appendix F.

4.3.3 Disposal Characterization Sampling

The Supervising Contractor will collect samples of the materials to be removed during property clean up. The material samples will be collected prior to excavation and will be analyzed for leachate concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents by the Toxicity Characterization Leaching Procedure (TCLP). USEPA will use the results of these analyses in identifying a suitable disposal site(s) for the materials.

Further details of the disposal characterization sampling and analysis procedures are described in the Construction Quality Assurance Plan, which is included in Appendix F.

4.4 Soil Removal

This section presents a description of residential yard soil removal activities. Included in this section are the details for the pre-excavation area preparation; excavation activities; noise control; odor control; dust control; and clean access for the property residents and decontamination procedures.

4.4.1 Pre-Excavation Area Preparation

Preparation of areas where excavation activities are to occur will commence following property owner approval to begin construction, as indicated by the owner's signatures on the access agreement and

the final Site Remediation Map. The Construction Contractor will notify the property owner and residents (if different) of the intended start date and time at least one week prior to the start of construction at a particular property. Access for any adjacent road apron areas will also be obtained in advance of construction.

Prior to beginning work on a particular property, the Construction Contractor will mark the limits of excavation (note: these limits will include any adjacent road apron areas). The Construction Contractor will also identify any land survey monuments (property corner pins, etc.) within the construction area. The location of such monuments will be documented on the Site Remediation Maps, and the monuments will be protected to prevent damage during construction. If disturbed, the monuments will be reset by a professional land survey following completion of property restoration.

Also prior to construction, the Construction Contractor will survey (via photographs and/or videotape) each property to establish pre-removal action conditions. The condition of buildings and other fixtures will also be noted, including characterizations of the integrity of structures and foundations with respect to the anticipated depth of excavation. Basements and ground-level rooms will be photographed from inside the home. Homeowners or tenants will also be asked about any existing drainage problems, and these will be noted on the photographs.

Immediately prior to beginning work on a particular property, the Construction Contractor will have the local utility companies locate the electrical, water, sewer, gas, cable, and phone lines. The owner/tenant will be notified of this activity and will be asked to participate, if needed, to provide information on subsurface obstacles such as septic systems and abandoned lines. The utility companies will mark the position of the utilities on the ground with colored spray paint. The Construction Contractor will inspect each excavation area for visible obstacles, and may utilize an electro-magnetic detector if there is reason to suspect buried obstructions have not been adequately marked. The Construction Contractor will confirm locations of subsurface obstacles by hand digging to trace the orientation of the obstacle and to mark it adequately with spray paint. The Construction Contractor will be particularly diligent in locating and hand excavating around all gas lines and will develop a project procedure to be used at all properties to ensure that gas lines are not disturbed or damaged during property remediation. The type and location of the obstacle will be noted on the Site Remediation Map, which will be issued to all work crews prior to construction startup at the property. Shields for subsurface pipelines and support members for retaining walls will be installed prior to the start of excavation activities, as warranted.

Surface obstacles to be removed by the property owner to permit remediation will be identified by the Supervising Contractor during the site visits and indicated on the final Site Remediation Map. The property owner will be required to relocate the surface obstacles and large possessions, such as RVs, boats, or vehicles, to a location where they will not hinder removal action construction. The property owners will be asked to discuss any concerns or special requests they may have in removing surface obstacles or in otherwise preparing their property for remediation. The Supervising Contractor will request that property owners remove and store inside their buildings all yard ornaments, personal possessions and keepsakes requiring special care. These items will be marked on the Site Remediation Map.

The Construction Contractor will temporarily relocate woodpiles, walkway stepping-stones, and other miscellaneous small landscape articles on the property, if possible. Large obstructions such as fences and gates will be removed if necessary to allow for ingress of equipment and access for the work crews. Removed obstructions will be stored onsite and replaced at the end of construction.

4.4.2 Excavation Activities

The Construction Contractor will remove soil using a variety of powered equipment and hand tools. Primary equipment will consist of bucket-equipped skid steers (e.g., bobcats) and small excavators, or equivalent. Soil will be removed to the specified 12 inch depth (4-inches beneath decks), taking care to hand excavate next to buildings, sidewalks, and other structures to maintain support and prevent damage. Soil will be sloped at a 45° angle away from the edges of rock structures, or weak concrete foundations or other supporting structures to prevent loss of support and potential weakening of these features.

Where subsurface utilities have been identified within an excavation area, soil around (but not beneath) these utilities will be hand excavated. If interruptions to any services occur as a result of removal activities, utility companies will be contacted immediately (no more than ½ hour after initial interruption) to aid in rapid re-establishment of services. Utility lines (including water, electric, gas, cable and telephone) damaged during removal action construction will be re-installed to current building code requirements.

Excavation by hand will be required for all areas susceptible to potential damage from construction equipment operations. Areas of concern include excavations adjacent to structures (i.e.,

houses, garages, sheds, paved driveways and sidewalks), and vegetation (i.e., trees, hedges, and large shrubs). The Construction Contractor will inspect structures and large tree roots during excavation operations, and will take immediate appropriate steps if either are damaged. Excavation around shrubs and tree roots will be performed by a combination of equipment and handwork to remove as much soil as practical without causing undue damage to the root system. This will generally result in a shallow excavation (typically 2 to 4 inches) from the trunk to the drip line and a tapering excavation from the drip line outward. Smaller shrubs will be removed, if required. Once excavation around plants is completed, backfill will be initiated as soon as possible and the replacement soils will be dampened to reduce plant stress.

If sprinkler systems are present, the system will be removed and reinstalled. In general, the sprinkler heads will be removed and saved along with major components such as manifolds, valves and controllers. The pipes will be removed and disposed. Prior to backfill, new pipes will be installed, and the salvaged components will be replaced.

Fences will generally be removed, salvaged, and replaced upon completion of backfill. Where feasible to leave in place during excavation, handwork around posts will be performed to maintain fence stability and prevent damage. Damaged fences or fences which cannot be re-installed following removal will be repaired or replaced with a new fence of similar type to the original.

Structures and buildings will be inspected for evidence of deformation or changes in condition attributable to the excavation or backfilling activities based on review of the pre-excavation photographs/videotape documentation. The Supervising Contractor will contact the homeowners when conditions are discovered that warrant such notifications.

The Construction Contractor and Supervising Contractor will perform field surveys and measurements to confirm that the required excavation extent and depth have been achieved (see Appendix F: Draft Construction Quality Assurance Plan). Once the Supervising Contractor has verified an excavation meets project requirements, the area will be cleared for backfilling.

If conditions are encountered which are beyond the control of the Construction Contractor that delay or prevent the performance of the construction at a particular property, the Construction Contractor will stop work at that location and immediately inform the Supervising Contractor and the property owner. The types of conditions that could delay or prevent construction include:

- Uncovering of artesian wells or other subsurface flow phenomena;
- Building or structural impairments; and
- Discovery of previously unidentified utilities or subsurface features such as abandoned septic systems.

4.4.3 Noise Control

Construction activities will be performed in a manner that complies with the state statute for noise abatement (Colorado Revised Statutes [CRS], Section 25-12-103). Specifically, during the normal working hours of 7:00 a.m. to 7:00 p.m., the construction noise will be maintained at a level below 80 db (measured at a distance of less than 25 feet from the property line). Noise levels may periodically increase but not exceed 90 db for more than 15 minutes in any one-hour period.

In order to ensure compliance with the statute, all equipment shall be maintained in proper condition with exhaust controls to minimize noise levels, and proper driving habits will be enforced. Additionally, use of compression-type brakes ("Jake Brakes") will not be allowed in the work area. A local telephone number will be set up by the Supervising Contractor and provided to the residents to allow reporting of noise complaints. If noise complaints are received, the Supervising Contractor will conduct periodic, unannounced noise surveys within 25 feet of the property line at the active work zones using a sound level meter. If noise levels are found to exceed the statute requirements, the Construction Contractor will be required to take corrective actions to bring its work area into compliance.

4.4.4 Dust Control

Water application will be used to minimize the potential for fugitive dust emissions. Application rates will be regulated to control dust yet not result in the generation of mud that could be transported offsite on haul trucks or other mobile equipment. Dust suppression equipment may consist of standard garden hoses and spray regulators, misters or other equipment proposed by the Construction Contractor and acceptable to USEPA. Water for dust control will be provided from a central metered source (i.e., hydrant) and transported to the work area by tanker truck or trailer.

The Construction Contractor will minimize water application during the course of excavation and restoration operations and will only use water on an as-needed basis to control dust as follows:

- During soil removal operations by heavy equipment and by hand crews;
- At work intervals where wind and/or dry weather require such actions to minimize visible dust generation; and
- During temporary stockpiling and loading of soils at staging areas before transportation to the disposal site.

Dust control requirements and provisions for periodic air monitoring are discussed in the Fugitive Emissions Dust Control Plan (Appendix E).

4.4.5 Odor Control

Soil removal replacement activities are not expected to result in the emission of odorous air contaminants. However, construction activities will comply with State requirements for odor control (5 Colorado Code of Regulations [CCR] 1001-4, Regulation 2). Specifically, any emissions of odorous air contaminants that result in detectable odors from construction activities after the odorous air has been diluted with seven more volumes of odor-free air will not be permitted.

4.4.6 Clean Access for Property Residents

During construction activities, clean access will be provided to the residents at all times. Clean access means the resident will not have to walk through soil prior to entering their home. Sidewalks will be thoroughly brushed off after each workday to provide as clean an entry as possible. If there is no sidewalk, a clean pathway will be provided by laying down plywood, pallets, plastic, or other means to prevent exposure and tracking of contaminated soils. All residents (especially children) will be asked to stay away from the construction area.

4.4.7 Decontamination Procedures

Heavy equipment and tools used in the construction process will be decontaminated prior to leaving the work area site. Decontamination will first involve a brush down of removal action equipment in the work area to remove visible accumulations of materials from the body and tires. Limited quantities of water may be used to remove residual visible contamination following dry brushing. However, water

use will be minimized. If washing is necessary, equipment will be washed while on the premises to minimize the migration of mud and water to the street.

Workers will be required to decontaminate daily, or whenever leaving a work area where soil removal activities are being performed. Streets, rights-of-way and access routes will be cleaned of visible accumulations of soil, dust, or debris that are attributable to construction activities.

Additional decontamination practices will be specified in a Construction Health and Safety Plan to be prepared by the Construction Contractor as a required submittal under the construction contract. USEPA and the Supervising Contractor will review the Construction Contractor's plan to confirm that it adequately specifies decontamination practices and procedures to protect workers and the public. Revisions to the plan will be required until it meets project requirements.

4.5 Soil Transportation and Disposal

Excavated materials will be removed to the selected disposal location(s) in accordance with the Transportation and Disposal Plan (Appendix D). The disposal locations will be either a licensed solid or hazardous waste disposal facility or the ASARCO Globe Plant. USEPA will review the result of the waste characterization analyses and will identify an appropriate disposal location based on these data.

If the excavated materials are relocated to a solid or hazardous waste disposal facility, the materials will be managed in accordance with State and Federal regulations pertaining to waste characterization, transportation and disposal. If the materials are relocated to the ASARCO Globe Plant, any incidental scrap materials and debris will be removed from the soil and shipped off-site for disposal at a licensed solid waste disposal facility. The remaining soils will be managed in accordance with existing State orders regarding management of metals-containing materials at the Globe Plant (State of Colorado, 1993).

Loading and transport activities will generally be performed at the same rate as excavation, to eliminate the need for stockpiling of large quantities of material in the residential neighborhoods.

4.6 Backfill and Restoration of Excavated Areas

After field measurements have confirmed that the design excavation depths have been achieved (see Appendix F), excavated areas will be cleared for backfill. Backfill will immediately follow excavation in order to minimize the amount of time excavated areas are left open. Clean material will not be carried in the same trucks as excavated soils unless the truck bed is decontaminated first.

The excavated areas will be backfilled with clean materials that are of comparable or better physical quality than the materials that were removed and meet the minimum requirements set out in Section 3.1. At a minimum, yards, gardens and flower beds will be replaced with 12 inches of soil. Driveways, parking areas, and other areas subject to vehicular traffic will be replaced with 8 inches of compacted soil and 4 inches of gravel top surfacing.

Replacement materials will be imported from approved off-site sources. Samples of the proposed replacement materials will be collected and analyzed to confirm that they meet the project requirements identified in Section 3.1 before the material sources are approved. Following source approval, quality control and quality assurance samples will be collected and analyzed on an on-going basis to confirm that the replacement materials continue to meet the project requirements. Details of the project quality control and quality assurance checks of the replacement materials are described in the Construction Quality Control Plan (Appendix F).

Where access allows, dump trucks with replacement materials will drive onto the excavation areas and deposit their load while driving slowly to spread the material. Where access is limited, the trucks will dump their load at an adjacent staging area from which a backhoe or bobcat can transport the material to the excavation. Some handwork using wheelbarrows and shovels may be necessary to backfill areas of difficult access. Following placement, the replacement materials will be graded and shaped to the approximate original conditions and slightly crowned to promote positive drainage. Gardens and flowerbeds will be slightly overfilled to compensate for material settling, as directed by the Supervising Contractor. Compaction of the replacement soil and gravel will be performed as deemed necessary by the Supervising Contractor. Suitable measures may include use of a plate compactor or hand tramping.

Following backfilling, the excavated areas will be restored to match their original conditions to the extent practicable, or as otherwise indicated on the Site Remediation Map. Replacement plants and vegetation will be installed in flowerbeds. Areas covered with grass will be re-vegetated with sod to

achieve vegetated cover similar to that which was originally present. However, total area of grass may be reduced as necessary to achieve the project objectives for grass coverage, as described in Section 3.1. (Bare soil areas will be replaced with mulch, decorative gravel, or other surface finish). Produce gardens will not be replanted. USEPA may provide garden center vouchers to cover the cost of replacing flower gardens if the existing plants cannot be replaced during the current planting season. Mulch, decorative gravels and other surface finishes will be installed to reasonably restore the yards to their original condition. In developing a restoration plan, the Supervising Contractor will focus on materials and plants that result in water efficient yards. Water efficient yards will be achieved by the following practices:

- Limiting the restored yard to no more than 50% sod or other high water consumption vegetation,
- Recommending drought tolerant plants, if practicable,
- Emphasizing the use of larger mulched areas around replacement trees, and
- Installing decorative gravels, mulch or asphalt pavement in areas previously used for lawn, or bare.

Finally, all materials such as fences, lawn ornaments, dog runs, etc. that were moved to allow removal actions will be restored to their original location, and any incidental damage to buried sprinkler systems, sidewalks, etc. will be repaired. In addition, any land survey monuments present within the excavation areas will be inspected. A professional land surveyor registered in Colorado will restore any monuments that have been damaged or disturbed during construction to their original (pre-construction) condition.

4.7 Post-Construction Maintenance

The Construction Contractor will maintain the replacement vegetation following property restoration. Restored properties will be maintained for thirty days. Maintenance will include all required vegetation watering and fertilizer applications but will not include mowing. (See Section 3.1 for a discussion of current bans on lawn watering.) Once the maintenance period has expired, care of the vegetation will be turned over to the property owner/tenant.

4.8 Follow-Up Activities

Follow-up activities will be conducted to verify that the work performed at each property satisfies the project requirements.

4.8.1 Photo Documentation

Photographs and/or videotapes will be used to document pre- and post-construction conditions of properties, streets, and side walks. Photographs and videos will be taken by the Construction Contractor immediately prior to construction and upon completion of the maintenance period. The Supervising Contractor will provide the Construction Coordinator with a checklist of the minimum photo documentation requirements. The Construction Contractor will provide all documentation necessary to complete the checklist and will provide the property-specific photo documentation to the Supervising Contractor within one week after the maintenance period for the property has expired.

4.8.2 Repair Work

Soil removal and replacement activities will be conducted to minimize damage to property. Any damaged features such as walkways or utilities will be repaired or replaced upon discovery and determination that the damage was caused by the construction activities. Structures (buildings, sidewalks, fences, etc.) and landscape features (trees, shrubs, etc.) damaged during property remediation will be repaired.

If doubt exists whether damage was caused during the construction process, video and photographic documentation taken before initiation of activities will be reviewed on a case-by-case basis. The decision to repair disputed damages will be made by the Supervising Contractor.

4.8.3 Property Inspection

Once the construction is completed, any repairs are completed and all disputes associated with the property remediation are resolved, the Supervising Contractor will inspect the property with the property owner. At this inspection, the as-built Site Remediation Map will be finalized and the property owner and

Supervising Contractor will sign-off that the work performed meets their satisfaction. If the property owner fails to show or declines to sign the as-built Site Remediation Map, the Supervising Contractor will inspect the property. If the property has been remediated and restored in a manner that has been acceptable to owners of other properties, the Supervising Contractor will sign the as-built Site Remediation Map and provide an assessment of the site conditions to USEPA. USEPA will then review the final as-built drawing signed by the owner and Supervising Contractor. If it meets the project requirements, USEPA will then sign the final as-built.

The property inspections will be performed at the end of the vegetation maintenance period.

5.0 CONSTRUCTION CONSIDERATIONS

This section describes overall construction management considerations associated with implementing the removal action. This section also identifies specific sequences and dependencies of activities, logistical requirements of various aspects of the work, material quantity estimates and health and safety considerations.

5.1 Project Sequence and Schedule

Based on the scope of the activities to be performed, it is estimated that the removal action construction will require one year to complete. A typical construction season will begin in the early spring and extend to late fall, unless unseasonably cold and wet weather shortens the period during which effective construction can be performed.

Property removal action activities will be coordinated with soil management activities at the disposal location to limit the need for stockpiling of soil in residential areas or at the disposal site. If the Globe Plant is the selected disposal site, the property removal action activities will be performed such that the material management activities at the Globe Plant comply with ASARCO's existing obligations.

The Supervising Contractor will prepare a Construction Sequence Plan and submit it to USEPA before beginning construction. The Construction Sequence Plan will identify the Supervising Contractor's proposed procedure for performing the work and will indicate the planned work period, methods that will be used to prioritize the properties for removal action, and the removal action sequence. The Construction Sequence Plan must be approved by USEPA prior to initiation of construction activities.

5.2 Material Quantity Estimates

As described in Appendix A, a total of 141 properties have lead or arsenic concentrations above the removal action levels. For this number of properties, it is estimated that the remediation activities will produce approximately 29,000 loose cubic yards (cy) of material for disposal. This volume is based on an average property loose soil volume of 205 cy, as determined from the previous removals at Globeville and the time-critical removal actions at VB/I70.

It is estimated that approximately 32,000 cy of loose replacement material will be required for property remediation. This estimate is based on the estimated volume of the material to be removed plus a 10 percent allowance for net shrinkage and loss. It is estimated that the replacement material volume will be comprised of approximately 31,600 cy of soil and 400 cy of gravel.

5.3 Construction Quality Assurance/Quality Control

Construction quality control and quality assurance testing and inspection procedures will be implemented to provide for proper construction and compliance with the construction plans and specifications. In this work plan and its supporting documents, quality control refers to the procedures, methods, and tests to be utilized by the Construction Contractor to exhibit compliance with the plans and specifications. Quality Assurance refers to inspections, checks and tests to be performed by the Supervising Contractor to evaluate and document achievement of, or deviation from, the substantive requirements and intent of the plans and specifications. Complete details of the construction quality control and quality assurance programs are provided in the Construction Quality Assurance Plan, which is included as Appendix F.

5.4 Health and Safety

The removal action activities will be required to comply with the requirements of 29 CFR 1910 and 1926. The Construction Contractor will prepare a construction Health and Safety Plan for the project which addresses health and safety practices for all project workers and the public. During all construction activities, the Construction Contractor will have a designated Health and Safety Coordinator. This individual will have authority over all personnel to enforce the project's health and safety requirements.

The Supervising Contractor will review and comply with the project Health & Safety Plan prepared by the Construction Contractor.

5.5 Compliance with ARARs

The residential remediation design has been prepared to comply with the Applicable or Relevant and Appropriate Requirements (ARARs) identified in the Non-Time-Critical Removal Action Memorandum (USEPA, 2003).

The ARARs from the Non-Time-Critical Removal Action Memorandum are shown in Tables 5-1 through 5-3. In addition, the tables identify the appropriate section within this report that provides design that will meet the substantive requirements of the ARARs.

5.6 Removal Action Cost Estimate

The preliminary remediation cost estimate is based on unit prices for similar work in Denver and the western United States, published unit prices and professional judgment assuming mid-2002 costs. The estimate assumes that 141 properties will require remediation and that all soils removed will be classified as solid wastes (non-hazardous). Two estimates have been prepared: one assuming disposal at a Denver-area municipal solid waste landfill and one assuming disposal at the ASARCO Globe Plant (Table 5-4 and 5-5, respectively). Direct removal action construction costs and indirect costs such as supplemental soil sampling, engineering and construction management/administration are included. The estimate includes an overall contingency of 15 percent to cover unforeseen costs.

The total removal action costs vary from approximately \$21,000 per property for the option of disposal at the Globe Plant to approximately \$23,000 per property for the option of disposal at the municipal solid waste landfill.

6.0 REMOVAL ACTION REPORTING

This section presents a summary of the removal action reporting, including monthly progress and annual construction reports.

6.1 Monthly Progress Reports

Construction reporting will include monthly progress reports prepared by the Supervising Contractor and submitted to the USEPA project manager. The monthly progress reports will be prepared beginning with the pre-removal action sampling phase and continue through construction completion.

Progress reports will summarize the progress of the work, costs, identify important changes or revisions to the project schedule or design, and present all analytical data and data validation reports generated during the reporting period. The progress reports will also include copies of the as-built Site Remediation Maps for properties remediated during the period. Further details of the monthly progress reporting requirements are included in the Construction Quality Assurance Plan, included as Appendix F.

6.2 Annual Construction Reports

An annual construction report will be prepared by the Supervising Contractor and submitted to the USEPA project manager following each construction season and upon construction completion. The annual construction report will summarize the construction activities performed during the period, including construction progress, field design changes, quality assurance/quality control data, project quantities, and costs. Final as-built Site Remediation Maps for properties remediated during the period will also be included in the annual report, as well as a statement by a Colorado-registered Professional Engineer certifying that the construction was performed in accordance with the approved plans and specifications or approved field changes. A summary of monthly construction reports will be included and all Daily Activity Logs, quality assurance/quality control information, material submittals, inspections, field change reports and other information necessary to document the construction will be appended to the annual report.

7.0 REFERENCES

- ASARCO Incorporated 2000. Contract Documents, South Globeville Residential Soils Remediation Project Blocks 4300, 4400 and 4500. January.
- CCR, Colorado Code of Regulations, 5CCR 1001-4, *Regulation 2 Odor Emissions*.
- CDPHE, 1997. *Soil Remediation Objectives: A Policy Outlining the Process For Developing Site-Specific Soil Remediation Objective*, Hazardous Materials and Waste Management Division, December 1997.
- CDPHE, 2002. Hazardous Materials and Waste Management Division , ASARCO Globe Plant website: www.cdphe.state.co.us/hm/rpglobe.asp.
- CRS, Colorado Revised Statutes, Section 25-12-103, *Maximum Permissible Noise Levels*.
- State of Colorado, 1993. *Final Consent Decree, Order, Judgment and Reference to Special Master*, Civil Action No. 83-C-2383, State of Colorado vs ASARCO Inc.
- USEPA, 2003. *Non-Time Critical Removal Action at the Vasquez Boulevard/Interstate 70 Environmental Justice NPL Site, Denver County, Denver Colorado*.
- USEPA, 2002b. *Proposed Plan for Cleaning Up Residential Soils within the Vasquez Boulevard and Interstate 70 Superfund Site Denver, CO*. May 2002.
- USEPA, 2002a. *Preliminary Design Report for the Community Health Program. Vasquez Boulevard and I-70 Superfund Site Denver, CO*. Prepared by MFG, Inc. and Tetra Tech EM Inc.
- USEPA, 2001b. *Feasibility Study Report for Operable Unit 1 Vasquez Boulevard/Interstate 70 Superfund Site*. Prepared by MFG, Inc. for the USEPA.
- USEPA, 2001a. *Baseline Human Health Risk Assessment. Vasquez Boulevard and I-70 Superfund Site Denver, CO. June 2001*. Produced by the USEPA with technical assistance from Syracuse Research Corporation.
- USEPA, 1999. *Project Plan for the Vasquez Boulevard & I-70 Site Phase III Field Investigation*. Prepared by ISSI Consulting Group, Inc.
- USEPA, 1998. *Request for a Time-Critical Removal Action at the Vasquez Boulevard and I-70 (aka North Denver Residential Soils) Site City and County of Denver, Colorado*. September 16, 1998.
- URS, 1999, *TCLP Disposal Date for Vasquez Boulevard and I-70 Site*. Letter from Mark Rudolph, URS Operating Services to Peter Stevenson, USEPA.
- Washington Group, 2001. *Remedial Investigation Report Vasquez Boulevard/I-70 Site Operable Unit 1*. Prepared by Washington Group International for the USEPA.

TABLES

Table 2-1
Replacement Material Chemical Criteria

Media	Constituent	Maximum Concentration ⁽¹⁾ (mg/Kg)
Replacement Soils	<i>Volatile Organic Compounds</i>	
	Benzene	0.6
	Carbon Tetrachloride	0.23
	1,1-Dichloroethane	546.8
	1,1-Dichloroethylene	0.05
	Ethylbenzene	1000
	Pentachlorophenol	0.51
	Tetrachloroethylene	20.2
	Toluene	667.85
	1,1,1-Trichloroethane	797.19
	Trichloroethylene	2.99
	Vinyl chloride	0.02
	<i>Semi-Volatile Organic Compounds</i>	
	Napthalene	289.1
	Phenol	1000
	Xylene (total)	1000
	<i>Pesticides/PCBs</i>	
	DDT	0.58
	Dieldrin	0.01
	PCBs	0.07
	Arochlor 1016	2.99
	Arochlor 1254	0.63
	<i>Metals ⁽²⁾</i>	
	Arsenic	15
	Cadmium and compounds	73
	Chromium (VI)	53.94
	Copper and compounds	2570
	Lead	195
	Mercury (inorganic)	17.66
Replacement Gravel	<i>Metals ⁽²⁾</i>	
	Arsenic	15
	Lead	195

Notes: ⁽¹⁾ Values from Tier 2 Soil Clean-up Table Value Standards (CDPHE, 1997), except for arsenic and lead site-specific PRGs (USEPA, 2001b), and cadmium from Globeville clean-up (CDPHE, 2002).

⁽²⁾ Analyses will be performed for total cadmium, chromium and copper.

TABLE 4-1

TYPICAL PROPERTY REMEDIATION SEQUENCE

Responsible Party	Activity
Supervising Contractor	Researches property ownership information and legal description from tax records. Develops a preliminary Site Remediation Map for each property.
Supervising Contractor	Contacts the property owner to introduce the program and determines if the owner is interested in participating. Obtains signed Access Agreement from property owner. Discusses garden and flowerbed sampling with owner. If the owner does not want to save any gardens or flowerbeds, works with owner to generate a final site Remediation Map, as described below.
Supervising Contractor	Performs garden and flowerbed sampling and analysis, if required. Prepares final Site Remediation Map based on owner input and garden and flowerbed sample results. Provides analytical results to USEPA in monthly report.
Supervising Contractor & Construction Contractor	Meets with property owner to review final Site Remediation Plan. Supervising Contractor and property owner sign the Final Site Remediation Map.
USEPA	Reviews Final Site Remediation Map. If acceptable, USEPA representative signs Final Site Remediation Map.
Supervising Contractor	Issues signed Final Site Remediation Map to Construction Contractor. Notifies property owner of planned construction date.
Construction Contractor and Supervising Contractor	Perform property remediation and post-remediation maintenance activities.
Supervising Contractor	Prepares as-built Site Remediation Map.
Supervising Contractor	Meets with property owner to review property remediation. If acceptable, Supervising Contractor and property owner sign as-built Site Remediation Maps.
USEPA	Reviews signed as-built. If acceptable, signs the as-built and issues letter to property owner certifying that property remediation has been completed.

TABLE 5-1

SUMMARY OF CHEMICAL-SPECIFIC ARARs AND HOW REQUIREMENTS ARE MET BY THE DESIGN

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment	Design Component that meets requirements
FEDERAL						
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with the removal action at would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.	Fugitive Emissions Dust Control Plan (Appendix E)
STATE						
Colorado Air Pollution Prevention and Control Act	Yes	--	5 CCR 1001-14	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS.	Construction activities associated with removal actions at the site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)
	No	Yes	5 CCR 1001-10 Part C (I) Regulation 8	Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The removal actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)

TABLE 5-2

SUMMARY OF LOCATION-SPECIFIC ARARs AND HOW REQUIREMENTS ARE MET BY THE DESIGN

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment	Design Component that meets requirements
SUMMARY OF POTENTIAL LOCATION-SPECIFIC ARARs						
Endangered Species Act	No	No	16 USC § 1531 <u>et seq.</u> ; 50 CFR 200 and 402	Provides protection for threatened and endangered species and their habitats.	Due to the urban nature of the site, threatened or endangered species are highly unlikely to be present. However, the Act would be applicable if endangered species were identified and affected by the removal action.	Not applicable – no threatened or endangered species have been identified.

TABLE 5-3

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
Hazardous and Solid Waste: 1. Solid waste determination	Yes	--	6 CCR 1007-3 Part 260 6 CCR 1007-3 Sect. 260.30-31 6 CCR 1007-3 Sect. 261.2 6 CCR 1007-3 Sect. 261.4	A solid waste is any discarded material that is not excluded by a variance granted under 40 CFR 260.30 and 260.31. Discarded material includes abandoned, recycled, and waste-like materials.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).
2. Solid waste classification.	Yes	--	6 CCR 1007-2, Section 1	If a generator of wastes has determined that the wastes do not meet the criteria for hazardous wastes, they are classified as solid wastes.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).
3. Determination of hazardous waste.	Yes	--	6 CCR 1007-3 Sect. 262.11 6 CCR 1007-3 Part 261	Wastes generated during soil excavation activities must be characterized and evaluated according to the following method to determine whether the waste is hazardous. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 milligrams per liter. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 milligrams per liter.	Applicable to alternatives where contaminated soil is excavated and disposed.	Disposal characteristics sampling (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F).

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets Requirements
Air Emission Control 4. Particulate emissions during excavation and backfill.	Yes	--	5 CCR 1001-3, Regulation 1, Section III (D) 5 CCR 1001-5, Regulation 3 5 CCR 1001-2, Section II	Colorado air pollution regulations require owners or operators of sources that emit fugitive particulates to minimize emissions through use of all available practical methods to reduce, prevent, and control emissions. In addition, no off-site transport of particulate matter is allowed. A fugitive dust control measure will be written into the workplan in consultation with the state for the removal action.	Applicable to alternatives where soil is excavated, moved, stored, transported or redistributed.	Fugitive Emissions Dust Control Plan (Appendix E)
5. Emission of hazardous air pollutants.	No	Yes	5 CCR 1001-10, Regulation 8	Emission of certain hazardous air pollutants is controlled by NESHAPs. Excavation and backfill of soils could potentially cause emission of hazardous air pollutants. Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The removal actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.	Fugitive Emissions Dust Control Plan (Appendix E)

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
6. Air emissions from diesel-powered vehicles associated with excavation and backfill operations.	Yes	--	5 CCR 1001-15, Regulation 12	<p>Colorado Diesel-Powered Vehicle Emissions Standards for Visible Pollutants apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways, and state as follows:</p> <ol style="list-style-type: none"> 1) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighting 7,500 pounds and less, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity. 2) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing more than 7,500 pounds, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 35% opacity, with the exception of subpart "C". 3) Any diesel-powered motor vehicle exceeding these requirements shall be exempt for a period of 10 minutes if the emissions are a direct result of a cold engine startup and provided the vehicle is in a stationary position. 4) These standards shall apply to motor vehicles intended, designed, and manufactured primarily for travel or use in transporting persons, property, auxiliary equipment, and/or cargo over roads, streets, and highways. 	Applicable to alternatives that include transportation of soil.	Transportation and Disposal Plan (Appendix D)

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
7. Odor emissions.	Yes	--	5 CCR 1001-4, Regulation 2	Colorado odor emission regulations require that no person shall allow emission of odorous air contaminants that result in detectable odors that are measured in excess of the following limits: For residential and commercial areas – odors detected after the odorous air has been diluted with seven more volumes of odor-free air.	Applicable to alternatives that include construction activities in residential areas.	Section 4.4.5
8. Smoke and opacity.	No	Yes	5 CCR 1001-3, Regulation 1, Sect. II.A	Excavation and backfilling of soils must be conducted in a manner that will not allow or cause the emission into the atmosphere of any air pollutant that is in excess of 20% opacity.	Regulation specifically exempts fugitive emissions generated by excavation/backfilling activities. Relevant and appropriate to alternatives that include excavation and backfilling of soils.	Fugitive Emissions Dust Control Plan (Appendix E).
9. Ambient Air Standard for Total Suspended Particulate Matter.	Yes	--	5 CCR 1001-14	Air quality standards for particulates (as PM ₁₀) are 50 µg/m ³ ; annual geometric mean, 150 µg/m ³ 24 hour.	Applicable to alternatives that include actions that generate fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix E).
10. Ambient Air Standard for Lead.	Yes	--	5CCR 1001-10, Regulation 8	Monthly air concentration must be less than 1.5 µg/m ³ .	Applicable to alternatives that include actions on contaminated soil that generate fugitive dust.	Fugitive Emissions Dust Control Plan (Appendix E).

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS																								
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements																		
11. Noise abatement	Yes	--	C.R.S., Section 25-12-103	<p>The Colorado Noise Abatement Statute provides that:</p> <p>a. "Applicable activities shall be conducted in a manner so any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Noise is defined to be a public nuisance if sound levels radiating from a property line at a distance of twenty-five feet or more exceed the sound levels established for the following time periods and zones:</p> <table><tr><td></td><td>7:00 a.m. to next 7:00 p.m.</td><td>7:00 p.m. to next 7:00 a.m.</td></tr><tr><td>Zone</td><td></td><td></td></tr><tr><td>Residential</td><td>55 db(A)</td><td>50 db(A)</td></tr><tr><td>Commercial</td><td>60 db(A)</td><td>55 db(A)</td></tr><tr><td>Light Industrial</td><td>70 db(A)</td><td>65 db(A)</td></tr><tr><td>Industrial</td><td>80 db(A)</td><td>75 db(A)</td></tr></table> <p>b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in Requirement a (above) may be increased by ten decibels for a period of not to exceed fifteen minutes in any one-hour period.</p> <p>c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five decibels less than those listed in Requirement a (above).</p> <p>d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.</p> <p>e. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.</p>		7:00 a.m. to next 7:00 p.m.	7:00 p.m. to next 7:00 a.m.	Zone			Residential	55 db(A)	50 db(A)	Commercial	60 db(A)	55 db(A)	Light Industrial	70 db(A)	65 db(A)	Industrial	80 db(A)	75 db(A)	Applicable to alternatives that include construction activities.	Noise Control Requirements-Section 4.4.3
	7:00 a.m. to next 7:00 p.m.	7:00 p.m. to next 7:00 a.m.																						
Zone																								
Residential	55 db(A)	50 db(A)																						
Commercial	60 db(A)	55 db(A)																						
Light Industrial	70 db(A)	65 db(A)																						
Industrial	80 db(A)	75 db(A)																						

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

STATE ARARS						
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
12. Transportation of Hazardous Waste.	Yes	--	8 CCR 1507	Rules regarding Transportation of Hazardous Substances.	Applicable to alternatives that include transportation of contaminated soil.	Transportation and Disposal Plan (Appendix D)

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

FEDERAL ARARS						
Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
Criteria for Classification of Solid Waste and Disposal Facilities and Practices	Yes	--	40 CFR Part 257	Establishes criteria for use in determining solid wastes and disposal requirements.	Would be applicable if solid wastes are generated (such as excavated soil).	Disposal sampling characteristics (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F)
Criteria for Classification of Hazardous Waste and Disposal Facilities and Practices	Yes	--	40 CFR 264	Establishes criteria for use in determining hazardous wastes and disposal requirements. Excavated soil would be classified as D004 hazardous waste if the arsenic concentration from the TCLP test was greater than 5.0 mg/l. Excavated soil would be classified as D008 hazardous waste if the lead concentration from the TCLP test was greater than 5.0 mg/l.	Would be applicable if hazardous wastes are generated. It is noted that previous soil removed had higher concentrations of lead and arsenic and were not hazardous wastes. However, these regulations are potentially applicable.	Disposal sampling characteristics (Section 4.2.2 of the Construction Quality Assurance Plan – Appendix F)

TABLE 5-3 (CONTINUED)

ACTION-SPECIFIC ARARS AND HOW REQUIREMENTS ARE MET BY THE DESIGN

FEDERAL ARARs						
Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments	Design Component that meets requirements
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standards are: 150 micrograms per cubic meter for particulate matter for a 24 hour period; 50 micrograms per cubic meter for particulate matter- annual arithmetic mean; 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with the removal action would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to particulates and to lead are relevant and appropriate.	Fugitive Emissions Dust Control Plan (Appendix E)
Hazardous Materials Transportation Regulations	Yes	--	49 CFR Parts 107, 171-177	Regulates transportation of hazardous materials.	Applicable only if the removal action involves off-site transportation of hazardous materials. The regulations affecting packaging, labeling, marking, placarding, using proper containers, and reporting discharges of hazardous materials would be potential ARARs.	Excavated soil not expected to be hazardous based on previous removals – would be addressed in the Transportation and Disposal Plan (Appendix D), if applicable.

TABLE 5-4

**REMOVAL ACTION COST ESTIMATE
DISPOSAL AT A MUNICIPAL SOLID WASTE (MSW) LANDFILL**

No.	ITEM	QUANTITY	UNIT	UNIT PRICE	PRICE
	Direct Costs				
1	Mobilization, Preparatory Work & Demobilization	1	ls	\$140,000.00	\$140,000.00
2	Yard Soil Removal (12")	745,000	sf	\$0.55	\$409,750.00
3	Transportation & Disposal @ MSW Landfill	29,000	cy	\$17.00	\$493,000.00
4	Backfill	32,000	cy	\$17.00	\$544,000.00
5	Gravel Backfill	400	cy	\$30.00	\$12,000.00
6	Sodding + 30 Days Watering/Fertilizer	445,000	sf	\$0.70	\$311,500.00
7	Restoration	141	properties	\$4,900.00	\$690,900.00
	Sub-Total Direct Costs				\$2,601,150.00
	Indirect Costs				
1	Engineering/Construction Mnmgt (USCOE estimate)				\$217,000.00
	Sub-Total: Indirect Costs				\$217,000.00
	TOTAL: Direct and Indirect Costs				\$2,818,150.00
	Contingency - 15% of Direct and Indirect Costs				\$422,700.00
	TOTAL COSTS				\$3,240,850.00

ls = lump sum
sf = square feet
cy = cubic yards

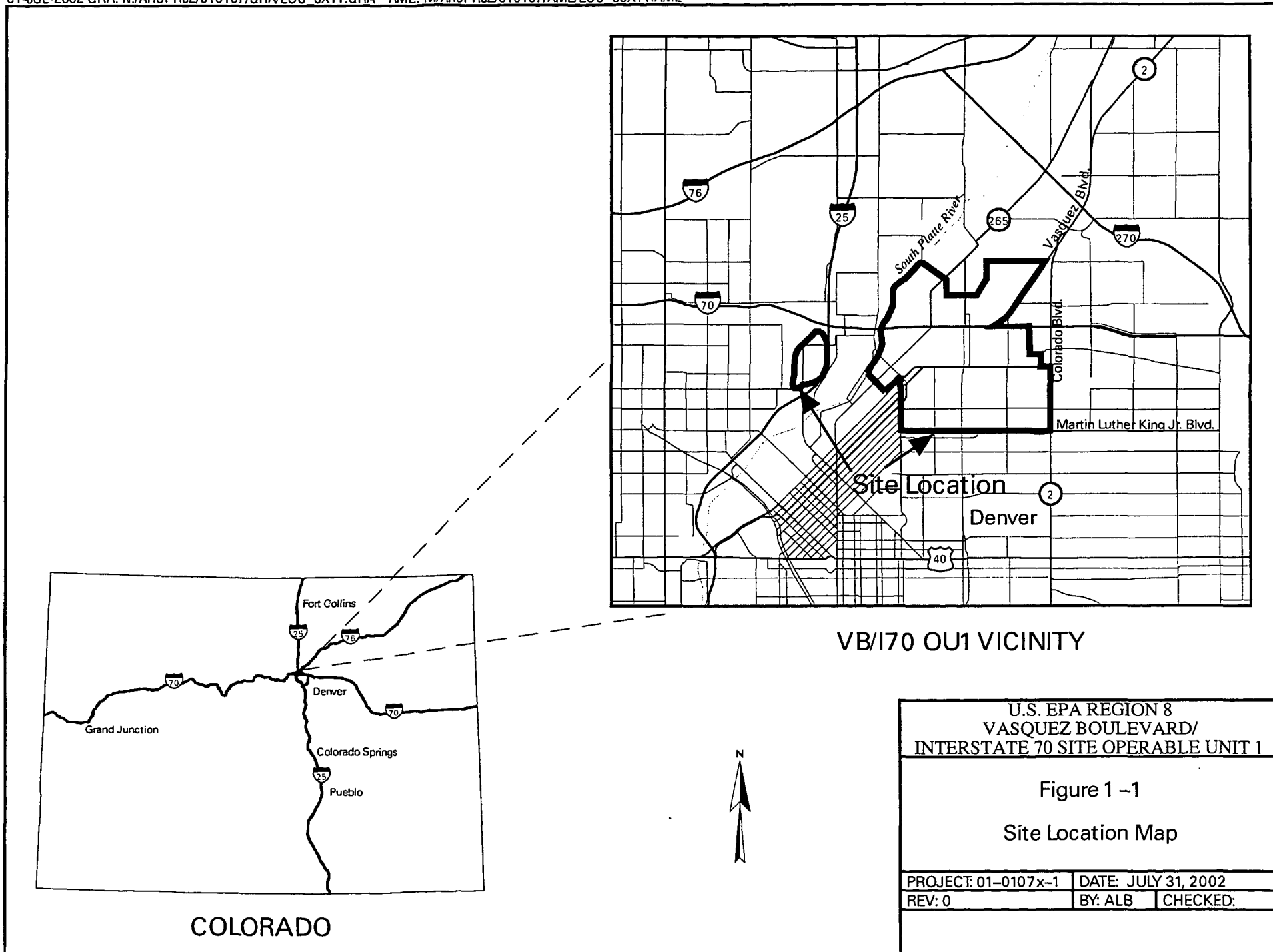
TABLE 5-5

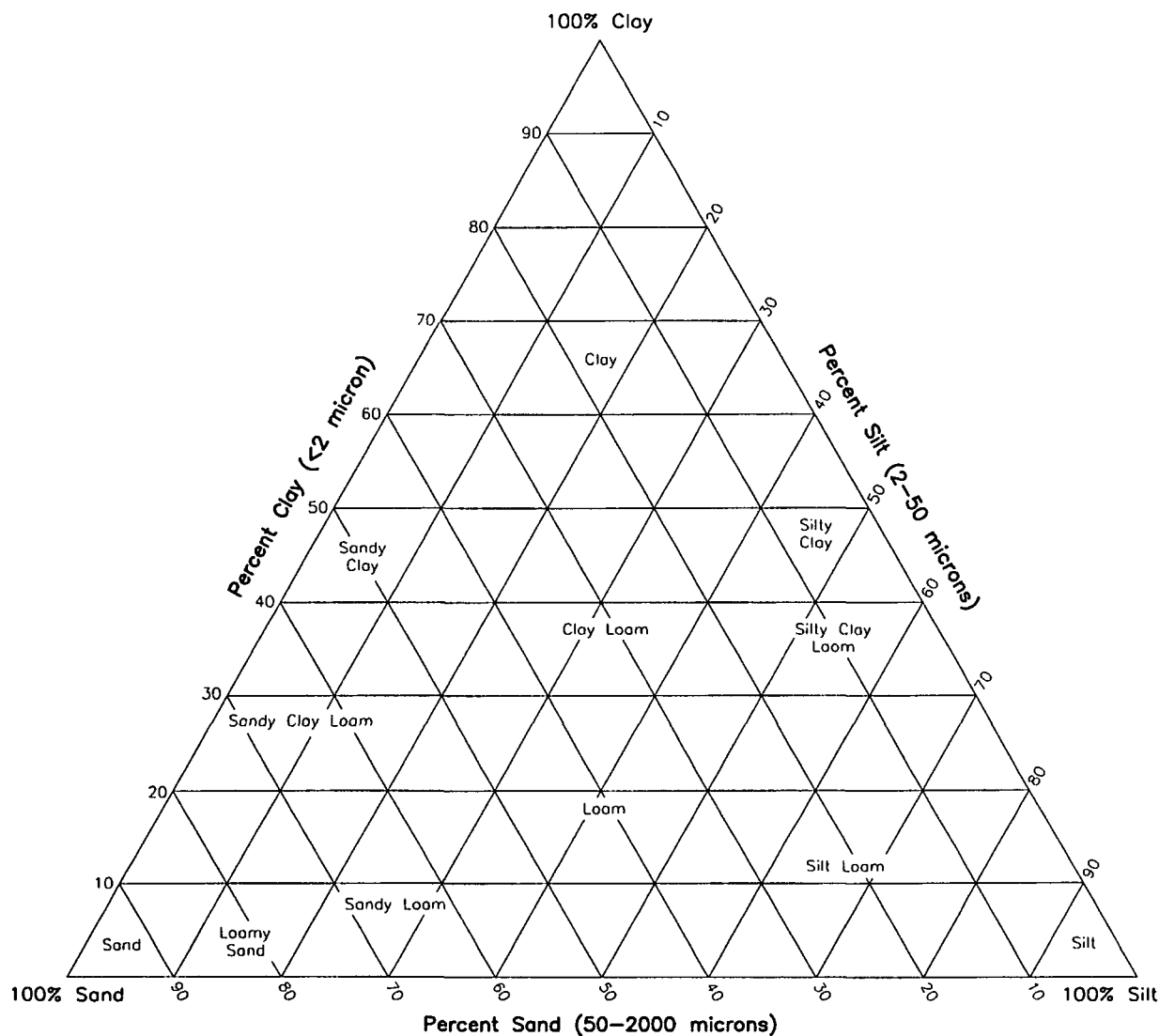
**REMOVAL ACTION COST ESTIMATE
DISPOSAL AT THE ASARCO GLOBE PLANT**

No.	ITEM	QUANTITY	UNIT	UNIT PRICE	PRICE
	Direct Costs				
1	Mobilization, Preparatory Work & Demobilization	1	ls	\$140,000.00	\$140,000.00
2	Yard Soil Removal (12")	745,000	sf	\$0.55	\$409,750.00
3	Transportation & Disposal @ Globe Plant	29,000	cy	\$8.00	\$232,000.00
4	Soil Backfill	32,000	cy	\$17.00	\$544,000.00
5	Gravel Backfill	400	cy	\$30.00	\$12,000.00
6	Sodding + 30 Days Watering/Fertilizer	445,000	sf	\$0.70	\$311,500.00
7	Restoration	141	properties	\$4,900.00	\$690,900.00
	Sub-Total Direct Costs				\$2,340,150.00
	Indirect Costs				
1	Engineering/Construction Mnmnt (USCOE Estimate)				\$217,000.00
	Sub-Total: Indirect Costs				\$217,000.00
	TOTAL: Direct and Indirect Costs				\$2,557,150.00
	Contingency - 15% of Direct and Indirect Costs				\$383,600.00
	TOTAL COSTS				\$2,940,750.00

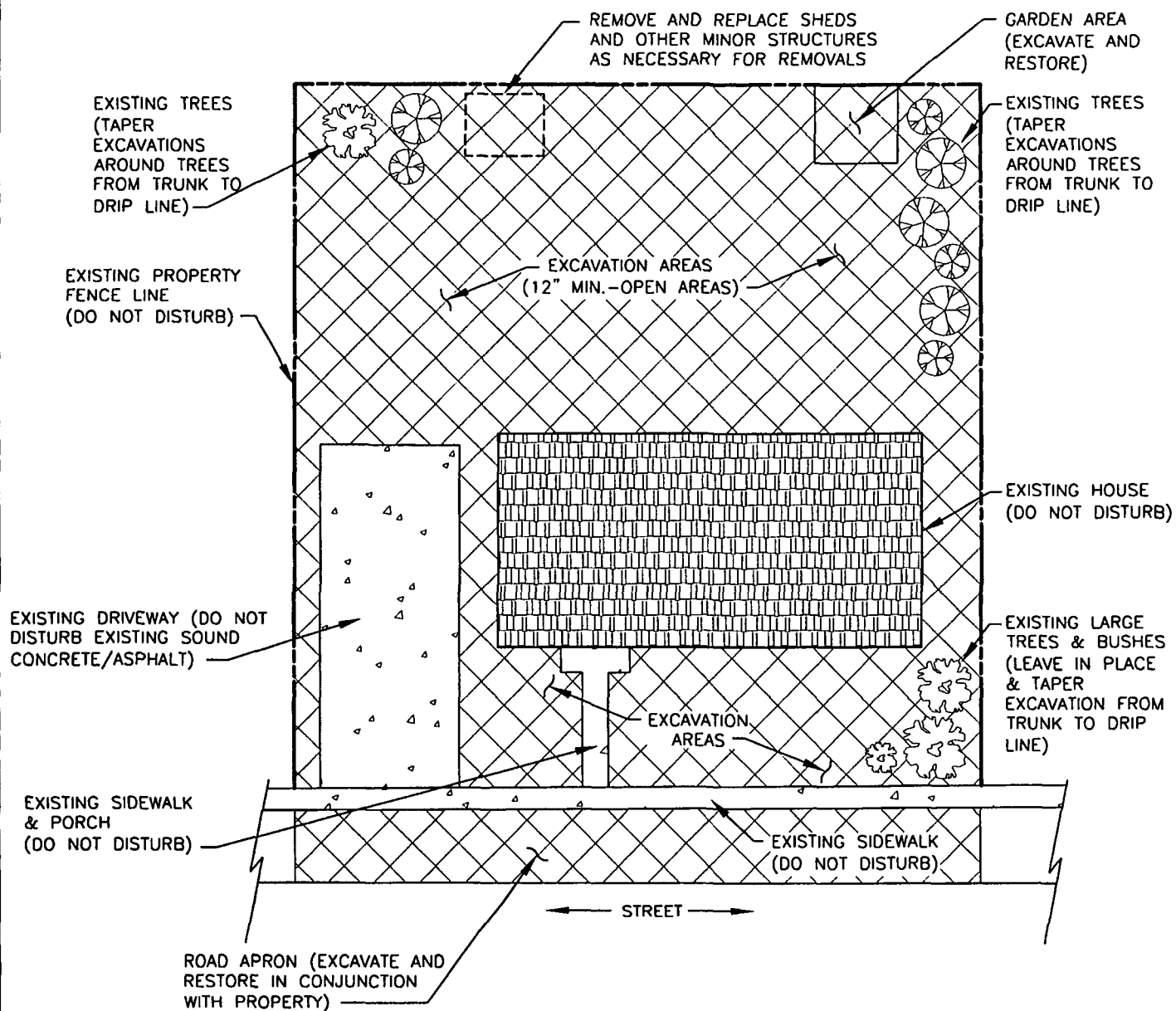
ls = lump sum
sf = square feet
cy = cubic yards

FIGURES





U.S. EPA REGION VIII	
VB/1-70 SUPERFUND SITE - OPERABLE UNIT 1	
REMOVAL ACTION WORK PLAN	
FIGURE 2-1	
SOIL TEXTURAL TRIANGLE	
PROJECT: 0107X.11	DATE: MARCH 2003
REV:	BY: DEP CHECKED: ACK
MFG, Inc. consulting scientists and engineers	



NOTES:

1. THIS DRAWING IS NOT TO SCALE.
2. SITE REMEDIATION PLANS WILL INCLUDE SIGNOFFS AS NECESSARY.

U.S. EPA REGION VIII
 VB/1-70 SUPERFUND SITE - OPERABLE UNIT 1
 REMOVAL ACTION WORK PLAN

FIGURE 3-1

TYPICAL SITE REMEDIATION PLAN

PROJECT: 0107X.11 | DATE: MARCH 2003
 REV: | BY: SCG | CHECKED: JHR

MFG, Inc.

consulting scientists and engineers

APPENDICES

APPENDIX A

LIST OF CANDIDATE PROPERTIES FOR REMOVAL ACTION

Appendix A

List of Candidate Properties for Removal Action

This appendix provides the list of candidate properties for cleanup during the removal action. The list was generated by comparing the arsenic and lead exposure point concentrations (EPCs) measured in yard soils to the removal action levels and identifying properties for which the EPCs exceeded the action levels. In addition, 5 properties which had previously been targeted for removal action, but access was refused were also included. These properties are 3351 Gaylord Street, 3423 Milwaukee Street, 3557 Gaylord Street, 4842 Steele Street, and 4718 Race Street.

A list of the properties that are candidates for removal action is shown in Table A-1. Property owner contact information is shown in Table A-2.

Table 1

List of Candidate Properties for Removal Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
1046	CLAYTON	3245 JOSEPHINE ST	264.6	272.6
1067	CLAYTON	3321 ELIZABETH ST	64.5	660.2
1450	CLAYTON	3337 STEELE ST	241.4	410.3
1070	CLAYTON	3339 ELIZABETH ST	157.7	1130.5
1071	CLAYTON	3343 ELIZABETH ST	49.7	769.1
1059	CLAYTON	3350 COLUMBINE ST	306.8	357.4
1571	CLAYTON	3401 BRUCE RANDOLPH AVE	370.6	320.5
1123	CLAYTON	3408 MILWAUKEE ST	343.0	714.9
1172	CLAYTON	3423 MILWAUKEE ST	410.5	264.7
1115	CLAYTON	3423 SAINT PAUL ST	315.6	227.5
1192	CLAYTON	3432 JOSEPHINE ST	313.0	456.0
1551	CLAYTON	3440 JACKSON ST	341.5	109.3
1527	CLAYTON	3441 GARFIELD ST	256.7	206.5
1118	CLAYTON	3441 SAINT PAUL ST	258.5	393.8
1119	CLAYTON	3447 SAINT PAUL ST	357.4	315.4
1609	CLAYTON	3450 SAINT PAUL ST	263.7	572.6
1188	CLAYTON	3452 JOSEPHINE ST	240.0	505.9
1697	CLAYTON	3515 HARRISON ST	266.3	146.1
1236	CLAYTON	3521 JOSEPHINE ST	249.8	343.5
1266	CLAYTON	3528 ELIZABETH ST	302.6	286.2
1272	CLAYTON	3535 CLAYTON ST	302.6	188.4
1265	CLAYTON	3536 ELIZABETH ST	327.0	271.5
1243	CLAYTON	3541 MILWAUKEE ST	318.6	690.1
1244	CLAYTON	3551 MILWAUKEE ST	383.0	903.7
1262	CLAYTON	3552 ELIZABETH ST	287.7	253.2
1260	CLAYTON	3560 ELIZABETH ST	243.4	286.4
1802	CLAYTON	3620 SAINT PAUL ST	258.5	468.2
1524	CLAYTON	3631 BRUCE RANDOLPH AVE	317.2	205.4
1775	CLAYTON	3637 MONROE ST	314.1	231.3
1745	CLAYTON	3655 HARRISON ST	326.9	163.9
1837	CLAYTON	3701 COOK ST	241.4	164.5
1831	CLAYTON	3705 MADISON ST	262.8	145.1
2823	CLAYTON	3710 MADISON ST	249.4	135.0
1336	CLAYTON	3724 YORK ST	260.2	417.9
2776	CLAYTON	3730 YORK ST	99.4	637.0
3882	CLAYTON	3906 JACKSON ST	290.5	226.2
1937	CLAYTON	3927 ADAMS ST	291.2	182.7
377	COLE	1815 E 36TH AVE	13.1	591.7
580	COLE	3209 GAYLORD ST	232.5	669.5
98	COLE	3209 HIGH ST	91.8	588.5
583	COLE	3227 GAYLORD ST	241.0	256.3
592	COLE	3230 GAYLORD ST	363.7	408.7
220	COLE	3326 WILLIAMS ST	17.9	657.0
163	COLE	3329 HIGH ST	284.6	598.6
171	COLE	3346 GILPIN ST	150.5	563.7
187	COLE	3350 GILPIN ST	293.2	510.7
655	COLE	3351 GAYLORD ST	470.0	476.7
192	COLE	3415 WILLIAMS ST	17.8	594.0
731	COLE	3421 VINE ST	296.8	249.9
234	COLE	3433 GILPIN ST	14.8	556.4
281	COLE	3453 FRANKLIN ST	24.1	583.4

Table 1 (Continued)

List of Candidate Properties for Removal Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
322	COLE	3511 HUMBOLDT ST	163.9	574.6
2660	COLE	3515 LAFAYETTE ST	154.4	598.4
340	COLE	3519 LAFAYETTE ST	18.8	590.6
2659	COLE	3522 MARION ST	33.8	635.9
341	COLE	3523 LAFAYETTE ST	25.2	569.1
2666	COLE	3529 FRANKLIN ST	17.8	711.3
2661	COLE	3531 LAFAYETTE ST	149.2	623.6
345	COLE	3541 WILLIAMS ST	16.3	796.8
802	COLE	3542 VINE ST	273.5	264.1
343	COLE	3549 LAFAYETTE ST	14.1	602.8
826	COLE	3549 RACE ST	390.7	268.6
811	COLE	3557 GAYLORD ST	488.4	369.2
837	COLE	3601 YORK ST	340.0	257.0
429	COLE	3609 HIGH ST	26.6	559.1
418	COLE	3616 WILLIAMS ST	15.2	610.1
479	COLE	3622 LAFAYETTE ST	390.7	371.9
438	COLE	3640 HUMBOLDT ST	212.4	641.0
60	COLE	3659 MARION ST	25.5	613.8
2608	COLE	3720 VINE ST	243.1	289.2
895	COLE	3722 RACE ST	172.2	1004.4
494	COLE	3743 FRANKLIN ST	5.5	844.8
509	COLE	3744 MARION ST	19.0	574.5
507	COLE	3754 MARION ST	25.9	610.6
3391	COLE	3760 FRANKLIN ST	40.3	953.7
2256	COLE	3765 GILPIN ST	111.8	573.1
2258	COLE	3781 GILPIN ST	133.5	578.3
2275	COLE	3784 GILPIN ST	26.7	728.3
3407	COLE	3786 GILPIN ST	47.7	1129.3
3429	COLE	3830 FRANKLIN ST	178.9	697.7
3428	COLE	3834 FRANKLIN ST	25.1	605.3
3415	COLE	3838 GILPIN ST	36.2	625.7
3414	COLE	3842 GILPIN ST	39.1	624.5
3447	COLE	3911 HUMBOLDT ST	39.9	725.9
3426	COLE	3942 WILLIAMS ST	34.5	587.1
2321	ELYRIA	4351 RACE ST	206.5	643.9
2341	ELYRIA	4620 RACE ST	16.9	598.6
2334	ELYRIA	4654 HIGH ST	27.5	585.6
2346	ELYRIA	4658 WILLIAMS ST	144.6	559.4
2370	ELYRIA	4712 BRIGHTON BLVD	5.5	580.1
2397	ELYRIA	4736 VINE ST	16.1	562.6
2379	ELYRIA	4781 RACE ST	11.9	618.3
12	FIVE POINTS	3521 DELGANY ST	30.8	835.1
19	FIVE POINTS	3646 DELGANY ST	21.4	725.2
2650	FIVE POINTS	3720 DELGANY ST	20.5	609.5
3	FIVE POINTS	3721 MARION ST	22.4	597.9
2648	FIVE POINTS	3742 DELGANY ST	335.3	516.6
22	FIVE POINTS	3746 BRIGHTON BLVD	75.6	565.5
2646	FIVE POINTS	3754 DELGANY ST	38.4	553.9
2407	GLOBEVILLE	4143 FOX ST	26.7	782.5
3616	GLOBEVILLE	4205 FOX ST	12.0	635.4
3621	GLOBEVILLE	4422 DELAWARE ST	258.7	517.6
2993	SWANSEA	4309 COLUMBINE ST	32.8	575.8
2056	SWANSEA	4314 JOSEPHINE ST	237.5	579.0

Table 1 (Continued)

List of Candidate Properties for Removal Action

Property ID	Neighborhood	Property Address	Arsenic Exposure Point Concentration (mg/Kg)	Lead Exposure Point Concentration (mg/Kg)
3070	SWANSEA	4315 STEELE ST	314.7	296.5
3068	SWANSEA	4318 SAINT PAUL ST	287.0	151.6
3048	SWANSEA	4319 FILLMORE ST	311.7	269.2
2060	SWANSEA	4340 JOSEPHINE ST	269.1	775.7
3111	SWANSEA	4442 JOSEPHINE ST	65.0	601.2
3080	SWANSEA	4459 THOMPSON CT	274.4	249.2
3132	SWANSEA	4539 COLUMBINE ST	188.2	678.8
3484	SWANSEA	4616 RACE ST	12.3	627.6
3168	SWANSEA	4635 FILLMORE ST	300.6	363.8
3298	SWANSEA	4640 FILLMORE ST	344.5	267.1
3297	SWANSEA	4650 FILLMORE ST	379.7	239.3
3501	SWANSEA	4653 HIGH ST	326.0	480.9
3174	SWANSEA	4660 MILWAUKEE ST	304.5	311.6
2157	SWANSEA	4680 CLAYTON ST	102.5	557.7
2191	SWANSEA	4701 FILLMORE	450.0	333.3
3344	SWANSEA	4705 CLAYTON ST	367.9	322.0
3554	SWANSEA	4710 RACE ST	12.6	583.1
	SWANSEA	4718 RACE ST	(1)	
3607	SWANSEA	4744 GAYLORD ST	277.9	296.7
3536	SWANSEA	4775 HIGH ST	254.5	411.1
3520	SWANSEA	4775 RACE ST	25.6	551.0
3275	SWANSEA	4780 COLUMBINE ST	156.2	572.8
3597	SWANSEA	4782 CLAUDE CT	30.9	544.6
3581	SWANSEA	4785 CLAUDE CT	248.0	416.4
3910	SWANSEA	4809 MILWAUKEE ST	382.0	210.1
3712	SWANSEA	4811 CLAYTON ST	314.2	216.3
2491	SWANSEA	4830 CLAYTON ST	337.5	342.2
	SWANSEA	4842 STEELE ST	(1)	
3702	SWANSEA	4850 CLAYTON ST	265.8	245.0
3865	SWANSEA	4909 MILWAUKEE ST	280.5	317.3
3872	SWANSEA	4920 MILWAUKEE ST	291.4	345.9
2478	SWANSEA	4932 STEELE ST	270.9	114.4
3676	SWANSEA	4935 ADAMS ST	299.6	158.7
2557	SWANSEA	4950 MILWAUKEE ST	270.0	364.7
3828	SWANSEA	4965 SAINT PAUL ST	378.1	313.6
3821	SWANSEA	4995 STEELE ST	273.0	264.5
3684	SWANSEA	5044 STEELE ST	157.7	605.7

Note: (1) Sampled prior to Phase III. Access for removal action refused in 1998.

Table 2

Property Owner Details for Removal Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
1046	CLAYTON	3245 JOSEPHINE ST	STACEY L & JOYCE E JONES		3245 JOSEPHINE ST	DENVER	CO	80205	303-291-0217	264.6	272.6
1067	CLAYTON	3321 ELIZABETH ST	WILLIAM H & ELIZABETH PHILLIPS		4988 WHEELING ST	DENVER	CO	80239	303-371-7426	64.5	660.2
1450	CLAYTON	3337 STEELE ST	TIMOTHY V SLAUGHTER		3337 STEELE ST	DENVER	CO	80205	303-355-9424	241.4	410.3
1070	CLAYTON	3339 ELIZABETH ST	DORIS M DUMAS		3339 ELIZABETH ST	DENVER	CO	80205	303-333-690	157.7	1130.5
1071	CLAYTON	3343 ELIZABETH ST	JOSEPH BAYKUN	ELYTE BAYKUN	3343 ELIZABETH ST	DENVER	CO	80205	303-377-5519	49.7	769.1
1059	CLAYTON	3350 COLUMBINE ST	VINCENTE & SOCORRO MUNOZ		3350 COLUMBINE ST	DENVER	CO	80205	303-780-0574	306.8	357.4
1571	CLAYTON	3401 BRUCE RANDOLPH AVE	WESLEY C WHITE	NATLINE SIDBERRY-WHITE	3401 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-377-6279	370.6	320.5
1571	CLAYTON	3401 BRUCE RANDOLPH AVE	NATLINE SIDBERRY-WHITE		3401 E 34TH AVE	DENVER	CO	80205		370.6	320.5
1123	CLAYTON	3408 MILWAUKEE ST	GERALD MARTIN		P.O. BOX 745034	ARVADA	CO	80006	303-554-3581	343.0	714.9
1172	CLAYTON	3423 MILWAUKEE ST	IVAN J & FRANCHELL GASKIN		3423 MILWAUKEE ST	DENVER	CO	80205	303-322-1762	410.5	264.7
1115	CLAYTON	3423 SAINT PAUL ST	BESSIE M LONG		3423 SAINT PAUL ST	DENVER	CO	80205	303-322-1605	315.6	227.5
1192	CLAYTON	3432 JOSEPHINE ST	CHRISTA & ARNOLD KILK		3432 JOSEPHINE ST	DENVER	CO	80205	303-321-7852	313.0	456.0
1551	CLAYTON	3440 JACKSON ST	CAROLYN CLEAVER		3440 JACKSON ST	DENVER	CO	80205	303-399-4650	341.5	109.3
1527	CLAYTON	3441 GARFIELD ST	NAOJI & NORIKO TSUTSUI		3447 GARFIELD ST	DENVER	CO	80205	303-333-9518	256.7	206.5
1118	CLAYTON	3441 SAINT PAUL ST	ROSE ANN BAUGH		3441 SAINT PAUL ST	DENVER	CO	80205	303-377-0896	258.5	393.8
1119	CLAYTON	3447 SAINT PAUL ST	WILLIAM W JR & LOIS M TAYLOR		3447 SAINT PAUL ST	DENVER	CO	80205	303-333-6672	357.4	315.4
1609	CLAYTON	3450 SAINT PAUL ST	ODESSA T JACKSON LIFE ESTATE	THOMASINE J HALLMAN	2116 LAFAYETTE ST	DENVER	CO	80205	303-861-9152	263.7	572.6
1188	CLAYTON	3452 JOSEPHINE ST	EDNA HARRIS		3452 JOSEPHINE ST	DENVER	CO	80205	303-399-6293	240.0	505.9
1697	CLAYTON	3515 HARRISON ST	HILDA M GARRISON		3515 HARRISON ST	DENVER	CO	80205		266.3	146.1
1236	CLAYTON	3521 JOSEPHINE ST	JOSEPH M & GLADYS L BROUSSARD		3521 JOSEPHINE ST	DENVER	CO	80205	303-295-6357	249.8	343.5
1266	CLAYTON	3528 ELIZABETH ST	MANUEL & IRMA QUEZADA		3528 ELIZABETH ST	DENVER	CO	80205	303-394-9113	302.6	286.2
1272	CLAYTON	3535 CLAYTON ST	JUAN FRANCISCO GARCIA	TERESA MENDOZA	3535 CLAYTON ST	DENVER	CO	80205	303-289-2588	302.6	188.4
1265	CLAYTON	3536 ELIZABETH ST	FRED J & CLARA B KING		3536 ELIZABETH ST	DENVER	CO	80205	303-333-3927	327.0	271.5
1243	CLAYTON	3541 MILWAUKEE ST	JUAN LUJAN		3541 MILWAUKEE ST	DENVER	CO	80216	303-329-0613	318.6	690.1
1244	CLAYTON	3551 MILWAUKEE ST	MARTIN & MARIA E HERRERA		1728 E 36TH AVE	DENVER	CO	80205	303-388-6158	383.0	903.7
1262	CLAYTON	3552 ELIZABETH ST	JIMMIE L WILLSON		3552 ELIZABETH ST	DENVER	CO	80205	303-394-4106	287.7	253.2
1260	CLAYTON	3560 ELIZABETH ST	SONDRA K HARVEY		3560 ELIZABETH ST	DENVER	CO	80205	303-322-4327	243.4	286.4
1802	CLAYTON	3620 SAINT PAUL ST	MIGUEL A VILLARREAL	GUADALUPE QUEZADA	3620 SAINT PAUL ST	DENVER	CO	80205	303-331-6649	258.5	468.2
1524	CLAYTON	3631 BRUCE RANDOLPH AVE	KERRY A MOORE		3631 BRUCE RANDOLPH AVE	DENVER	CO	80205	303-329-8088	317.2	205.4
1775	CLAYTON	3637 MONROE ST	SERGIO IBARRA		3637 MONROE ST	DENVER	CO	80205	303-377-3683	314.1	231.3
1745	CLAYTON	3655 HARRISON ST	LEWIS JR & CLEMMIE DANIELS		3655 HARRISON ST	DENVER	CO	80205		326.9	163.9
1837	CLAYTON	3701 COOK ST	SAUL & MARIA ROSA VASQUEZ		3701 COOK ST	DENVER	CO	80205	303-394-0829	241.4	164.5
1831	CLAYTON	3705 MADISON ST	ELLEN ANTHONY		3705 MADISON ST	DENVER	CO	80205	303-377-2235	262.8	145.1
2823	CLAYTON	3710 MADISON ST	ROGER B MAUPIN		PO BOX 621061	LITTLETON	CO	80162	979-0243	249.4	135.0
1336	CLAYTON	3724 YORK ST	VICTORIA H ORTIZ		3724 YORK ST	DENVER	CO	80205	303-298-9640	260.2	417.9
2776	CLAYTON	3730 YORK ST	ART ARITA		1020 CUCHARA ST	DENVER	CO	80221	429-5382	99.4	637.0
3882	CLAYTON	3906 JACKSON ST	SHIRLEY JONES		3906 JACKSON ST	DENVER	CO	80205	303-355-6683	290.5	226.2
1937	CLAYTON	3927 ADAMS ST	MARIA F & RICARDO OLVERA		7156 BIRCH ST	COMMERCE CITY	CO	80022	303-289-8569	291.2	182.7
377	COLE	1815 E 36TH AVE	RICHARD CLAYTON CHANEY		3608 WILLIAMS ST	DENVER	CO	80205		13.1	591.7
580	COLE	3209 GAYLORD ST	LELA MAE BUGGS	DOROTHY R WINN	3209 GAYLORD ST	DENVER	CO	80205	303-337-7633	232.5	669.5
98	COLE	3209 HIGH ST	ALEJANDRO PEDROZA		3209 HIGH ST	DENVER	CO	80205	303-296-1056	91.8	588.5
583	COLE	3227 GAYLORD ST	TOM BUSHU		PO BOX 100066	DENVER	CO	80250		241.0	256.3
592	COLE	3230 GAYLORD ST	CHRIS MEZA		3230 GAYLORD ST	DENVER	CO	80205	303-321-7566	363.7	408.7
220	COLE	3326 WILLIAMS ST	ROBERT D & CONNIE V BLEA		3326 WILLIAMS ST	DENVER	CO	80205		17.9	657.0
163	COLE	3329 HIGH ST	TEXANNA C STRIGGLES		3329 HIGH ST	DENVER	CO	80205	303-295-6741	284.6	598.6
171	COLE	3346 GILPIN ST	JOE & LUCILLE HUNT		3346 GILPIN ST	DENVER	CO	80205	303-295-6777	150.5	563.7
187	COLE	3350 GILPIN ST	CADREC, ATTN: J T PETERSON		3350 GILPIN ST	DENVER	CO	80205	303-295-2521	293.2	510.7
655	COLE	3351 GAYLORD ST	STEVENSON T & MATTIE HOLMES		3351 GAYLORD ST	DENVER	CO	80205	303-295-6520	470.0	476.7
192	COLE	3415 WILLIAMS ST	MARIA CASILLAS		3415 WILLIAMS ST	DENVER	CO	80205	303-296-2167	17.8	594.0
731	COLE	3421 VINE ST	JERRY VALENTINE-HARLAN		3421 VINE ST	DENVER	CO	80205	303-296-6936	296.8	249.9
234	COLE	3433 GILPIN ST	ELEANOR RUTH SATCHELL		3433 GILPIN ST	DENVER	CO	80205	303-296-9151	14.8	556.4
281	COLE	3453 FRANKLIN ST	3453 FRANKLIN STREET LLC		2516 WASHINGTON ST	DENVER	CO	80205	303-831-7368	24.1	583.4
322	COLE	3511 HUMBOLDT ST	JOHN C & ANGELA T DERR		3511 HUMBOLDT ST	DENVER	CO	80205	303-295-7503	163.9	574.6
2660	COLE	3515 LAFAYETTE ST	FERNANDO L BARRON		3515 LAFAYETTE ST	DENVER	CO	80205	296-8112	154.4	598.4
340	COLE	3519 LAFAYETTE ST	FERMIN C & MARTINA HERRERA		1345 EXPLORADOR CALLE	THORNTON	CO	80229	303-289-7428	18.8	590.6
2659	COLE	3522 MARION ST	STELLA MAE HOUSTON		3522 MARION ST	DENVER	CO	80205	295-6068	33.8	635.9
341	COLE	3523 LAFAYETTE ST	RONNIE L MONTANO		3543 HUMBOLDT ST	DENVER	CO	80205	303-297-8633	25.2	569.1
2666	COLE	3529 FRANKLIN ST	ELLEN V & HALL		3529 FRANKLIN ST	DENVER	CO	80205	7790694	17.8	711.3
2661	COLE	3531 LAFAYETTE ST	LORENE R REPOSA		3002 ABILENE ST	AURORA	CO	80010	3668386	149.2	623.6
345	COLE	3541 WILLIAMS ST	EVERTT E & G JUNE NELSON		PO BOX 787	ARVADA	CO	80001	303-422-7577	16.3	796.8
802	COLE	3542 VINE ST	JEAN M TURNER		3542 VINE ST	DENVER	CO	80205	303-295-6625	273.5	264.1

Table 2 (Continued)

Property Owner Details for Removal Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
343	COLE	3549 LAFAYETTE ST	MICHAEL E PATTERSON		3549 LAFAYETTE ST	DENVER	CO	80205		14.1	602.8
343	COLE	3549 LAFAYETTE ST	K BRENT WHISTLER		3549 LAFAYETTE ST	DENVER	CO	80205	303-298-7205	14.1	602.8
826	COLE	3549 RACE ST	SARAH G HAMER		3549 RACE ST	DENVER	CO	80205	303-298-1449	390.7	268.6
811	COLE	3557 GAYLORD ST	DONNA JEAN TRUST FRANKLIN		3557 GAYLORD ST	DENVER	CO	80205	303-292-9580	488.4	369.2
837	COLE	3601 YORK ST	DOMINGO & ERNESTINE ROMERO		3601 YORK ST	DENVER	CO	80205	303-293-6776	340.0	257.0
429	COLE	3609 HIGH ST	LORENZO SOTO		3609 HIGH ST	DENVER	CO	80205	303-298-9404	26.6	559.1
418	COLE	3616 WILLIAMS ST	VICTOR FELIPE PENA		599 TROY ST	AURORA	CO	80011		15.2	610.1
479	COLE	3622 LAFAYETTE ST	SOPHIA A RODRIGUEZ		3622 LAFAYETTE ST	DENVER	CO	80205	303-292-5261	390.7	371.9
438	COLE	3640 HUMBOLDT ST	JESUS M MARTINEZ		3640 HUMBOLDT ST	DENVER	CO	80205		212.4	641.0
60	COLE	3659 MARION ST	HOOD REAL ESTATE LLC		PO BOX 9461	DENVER	CO	80209	303-688-1372	25.5	613.8
2608	COLE	3720 VINE ST	CRAWFORD MARGARET AN	LESSIE M GUSS	3720 VINE ST	DENVER	CO	80205	303-298-8571	243.1	289.2
895	COLE	3722 RACE ST	WINNIFRED BAXTER		3722 RACE ST	DENVER	CO	80205	303-297-8966	172.2	1004.4
494	COLE	3743 FRANKLIN ST	JOSE BANUELOS		3743 FRANKLIN ST	DENVER	CO	80205	303-295-1719	5.5	844.8
509	COLE	3744 MARION ST	FOUR EQUITIES GROUP INC	BAUDELIO CASILLAS	3744 MARION ST	DENVER	CO	80205	303-297-9019	19.0	574.5
507	COLE	3754 MARION ST	ELNORA ELIZABETH WILLIAMS		3754 MARION ST	DENVER	CO	80205	303-296-6316	25.9	610.6
3391	COLE	3760 FRANKLIN ST	MARIA GUADALUPE GONZALES		3760 FRANKLIN ST	DENVER	CO	80205	2987716	40.3	953.7
2256	COLE	3765 GILPIN ST	LORRIE KINGSBERRY		3765 GILPIN ST	DENVER	CO	80205		111.8	573.1
2258	COLE	3781 GILPIN ST	ANN-MARIE MORISSETTE		3781 GILPIN ST	DENVER	CO	80205	303-288-7727	133.5	578.3
2275	COLE	3784 GILPIN ST	LYNNE C CHARLES	STEPHEN METCALF	3748 FRANKLIN ST	DENVER	CO	80205	303-292-0176	26.7	728.3
3407	COLE	3786 GILPIN ST	DEBB MUMFORD		3786 GILPIN ST	DENVER	CO	80205	2981960	47.7	1129.3
3429	COLE	3830 FRANKLIN ST	LARRY & MARY ODELIA MARTINEZ		3830 FRANKLIN ST	DENVER	CO	80205	2953801	178.9	697.7
3428	COLE	3834 FRANKLIN ST	JOHN E MCNEIL		3834 FRANKLIN ST	DENVER	CO	80205	2966235	25.1	605.3
3415	COLE	3838 GILPIN ST	LINDA TOLMICH		3838 GILPIN ST	DENVER	CO	80205	2971914	36.2	625.7
3415	COLE	3838 GILPIN ST	ROSE VILLA		3838 GILPIN ST	DENVER	CO	80205		36.2	625.7
3414	COLE	3842 GILPIN ST	ROSEMARIE FONTAINE		10475 KALAMATH ST	NORTHGLENN	CO	80234	303-457-2762	39.1	624.5
3414	COLE	3842 GILPIN ST	JERRY & LAVINIA M DOTTAVIO		10475 KALAMATH ST	NORTHGLENN	CO	80234	4572762	39.1	624.5
3447	COLE	3911 HUMBOLDT ST	MARIA DEL PILAR RUBIO		136 CHICHESTER	SAN ANTONIO	TX	78209	2968849	39.9	725.9
3426	COLE	3942 WILLIAMS ST	ALFONSO CASTILLO		3942 WILLIAMS ST	DENVER	CO	80216	2956862	34.5	587.1
2321	ELYRIA	4351 RACE ST	BERNADETTE D TANGREN		4351 RACE ST	DENVER	CO	80216	303-296-8225	206.5	643.9
2341	ELYRIA	4620 RACE ST	VIBHA SHARMA		1641 W 116TH CT	WESTMINSTER	CO	80234	303-469-5950	16.9	598.6
2334	ELYRIA	4654 HIGH ST	DAVID A SMITH		2015 E 26TH AVE	DENVER	CO	80205		27.5	585.6
2346	ELYRIA	4658 WILLIAMS ST	JOSIE P GONZALES	ERNEST SANCHEZ	4658 WILLIAMS ST	DENVER	CO	80216		144.6	559.4
2370	ELYRIA	4712 BRIGHTON BLVD	FRED C & PATRICIA K MCPECK		4700 BRIGHTON BLVD	DENVER	CO	80216	303-232-5824	5.5	580.1
2397	ELYRIA	4736 VINE ST	TRINCLINO GARCIA		4740 VINE ST	DENVER	CO	80216		16.1	562.6
2379	ELYRIA	4781 RACE ST	DAVID GUTIERREZ		4781 RACE ST	DENVER	CO	80216	303-298-7721	11.9	618.3
12	FIVE POINTS	3521 DELGANY ST	DMC PROPERTY CORP		1321 DELAWARE ST	DENVER	CO	80204	303-623-2245	30.8	835.1
19	FIVE POINTS	3646 DELGANY ST	LARRY LEE BURGESS		3 RED FOX LN	LITTLETON	CO	80127	303-972-9399	21.4	725.2
2650	FIVE POINTS	3720 DELGANY ST	RICHARD TRZCINSKI		3720 DELGANY ST	DENVER	CO	80205	2949496	20.5	609.5
3	FIVE POINTS	3721 MARION ST	SAMUEL & BENIGNA SARMIENTO		3721 MARION ST	DENVER	CO	80205	303-298-8586	22.4	597.9
2648	FIVE POINTS	3742 DELGANY ST	TONY GONZALES		3742 DELGANY ST	DENVER	CO	80205	2969576	335.3	516.6
22	FIVE POINTS	3746 BRIGHTON BLVD	ETHEL M & DAVID J POPISH		3746 BRIGHTON BLVD	DENVER	CO	80216		75.6	565.5
2646	FIVE POINTS	3754 DELGANY ST	BRIAN MONDRAGON		3754 DELGANY ST	DENVER	CO	80205	2938429	38.4	553.9
2407	GLOBEVILLE	4143 FOX ST	RICKY R & MARILYN DEWITT	GERALD LEE DEWITT	6030 JOHNSON WAY	ARVADA	CO	80004	303-424-4092	26.7	782.5
3616	GLOBEVILLE	4205 FOX ST	SALVADOR & CONSUELO DELATORRE		5970 S WOLFF CT	LITTLETON	CO	80123	7953203	12.0	635.4
3621	GLOBEVILLE	4422 DELAWARE ST	STEPHEN W MADSEN		2533 W 43RD AVE W MOFFAT PL	DENVER	CO	80221	4771466	258.7	517.6
3621	GLOBEVILLE	4422 DELAWARE ST	ERIKS E LINDEMANIS		6592 S DOVER ST	LITTLETON	CO	80123	303-550-2438	258.7	517.6
2993	SWANSEA	4309 COLUMBINE ST	MANUEL N & CONSUELO ESCORZA		4309 COLUMBINE ST	DENVER	CO	80216	2956079	32.8	575.8
2056	SWANSEA	4314 JOSEPHINE ST	CLORINDA SANTISTEVAN		4314 JOSEPHINE ST	DENVER	CO	80216	303-296-8025	237.5	579.0
3070	SWANSEA	4315 STEELE ST	JOHN NAVARRO		4315 STEELE ST	DENVER	CO	80216	2989064	314.7	296.5
3068	SWANSEA	4318 SAINT PAUL ST	HORACIO & SHANNON DELAO		4318 SAINT PAUL ST	DENVER	CO	80216	303-296-3983	287.0	151.6
3048	SWANSEA	4319 FILLMORE ST	DON R & SHARON A FOWLER		4319 FILLMORE ST	DENVER	CO	80216	2923234	311.7	269.2
2060	SWANSEA	4340 JOSEPHINE ST	ABIGAIL RAMIREZ		4340 JOSEPHINE ST	DENVER	CO	80216	303-292-5762	269.1	775.7
3111	SWANSEA	4442 JOSEPHINE ST	RICK KEENAN		8018 W 78TH WAY	ARVADA	CO	80005	303-423-6000	65.0	601.2
3080	SWANSEA	4459 THOMPSON CT	ROY AND BARBARA ROMER						293-2955	274.4	249.2
3080	SWANSEA	4459 THOMPSON CT	JULIE IBARRA		4459 THOMPSON CT	DENVER	CO	80216	303-293-2358	274.4	249.2
3132	SWANSEA	4539 COLUMBINE ST	JAMIE RAMIREZ		4539 COLUMBINE ST	DENVER	CO	80216	292-5762	188.2	678.8
3484	SWANSEA	4616 RACE ST	DMC PROPERTY CORP		1321 DELAWARE ST	DENVER	CO	80204	303-623-2245	12.3	627.6
3168	SWANSEA	4635 FILLMORE ST	ANN TRUJILLO		4635 FILLMORE ST	DENVER	CO	80216	295-7702	300.6	363.8
3298	SWANSEA	4640 FILLMORE ST	IRMA E & ARTHUR A CROFF		4640 FILLMORE ST	DENVER	CO	80216		344.5	267.1
3297	SWANSEA	4650 FILLMORE ST	DOROTHEA E C SINGER		4650 FILLMORE ST	DENVER	CO	80216	296-4172	379.7	239.3
3111	SWANSEA	4442 JOSEPHINE ST	RICK KEENAN		8018 W 78TH WAY	ARVADA	CO	80005	303-423-6000	65.0	601.2

Table 2 (Continued)

Property Owner Details for Removal Action Candidate Properties

Property ID	Neighborhood	Property Address	Owner Name	Second Owner Name	Owner Mailing Address				Owner Phone Number	Arsenic Exposure Point Conc. (mg/Kg)	Lead Exposure Point Conc. (mg/Kg)
3501	SWANSEA	4653 HIGH ST	WALTER PINE		4653 HIGH ST	DENVER	CO	80216	296-3969	326.0	480.9
3174	SWANSEA	4660 MILWAUKEE ST	GILBERT P MONDRAGON		4660 MILWAUKEE ST	DENVER	CO	80216	295-3764	304.5	311.6
2157	SWANSEA	4680 CLAYTON ST	FRANCISCO Z & CECILIA AREVALO		4680 CLAYTON ST	DENVER	CO	80216	303-292-6280	102.5	557.7
2191	SWANSEA	4701 FILLMORE	WALTER SCOTT WARD	RUBY CLARA WARD	4701 FILLMORE ST	DENVER	CO	80216		450.0	333.3
3344	SWANSEA	4705 CLAYTON ST	MARGARET MAXINE RADCLIFF		4705 CLAYTON ST	DENVER	CO	80216	296-4632	367.9	322.0
3554	SWANSEA	4710 RACE ST	MICHAELA HERNANDEZ		4710 RACE ST	DENVER	CO	80216	293-2863	12.6	583.1
3607	SWANSEA	4744 GAYLORD ST	LEOPALDO MORENO		4744 GAYLORD ST	DENVER	CO	80216	292-6230	277.9	296.7
3607	SWANSEA	4744 GAYLORD ST	RAFAEL GUTIERREZ		4744 GAYLORD ST	DENVER	CO	80216	303-675-0918	277.9	296.7
3536	SWANSEA	4775 HIGH ST	BENITO & MARY ZAMORA		2745 CARNATION WAY	THORNTON	CO	80229	296-4486	254.5	411.1
3520	SWANSEA	4775 RACE ST	BENNIE ALARCON		2024 W 46TH AVE	DENVER	CO	80211	296-4250	25.6	551.0
3275	SWANSEA	4780 COLUMBINE ST	DAVID SILVA	MARIANA CHAVEZ	4780 COLUMBINE ST	DENVER	CO	80216	303-308-9657	156.2	572.8
3275	SWANSEA	4780 COLUMBINE ST	IGHALIOTT MOLINA		4780 COLUMBINE ST	DENVER	CO	80216	292-5785	156.2	572.8
3597	SWANSEA	4782 CLAUDE CT	GLEN DWAYNE HARVEY		4782 CLAUDE CT	DENVER	CO	80216	297-3407	30.9	544.6
3581	SWANSEA	4785 CLAUDE CT	DELIA VIOLA ORTEGA		4785 CLAUDE CT	DENVER	CO	80216	297-3946	248.0	416.4
3910	SWANSEA	4809 MILWAUKEE ST	ISABELLA PENA		4809 MILWAUKEE ST	DENVER	CO	80216	303-298-7831	382.0	210.1
3712	SWANSEA	4811 CLAYTON ST	ALBERT & ERMA L PEREZ		4811 CLAYTON ST	DENVER	CO	80216	296-6113	314.2	216.3
2491	SWANSEA	4830 CLAYTON ST	SAMUEL & THELMA MAE GREEN		4830 CLAYTON ST	DENVER	CO	80216		337.5	342.2
3702	SWANSEA	4850 CLAYTON ST	JAVIER & MARGARITA MONTES LARA		4850 CLAYTON ST	DENVER	CO	80216	296-2521	265.8	245.0
3865	SWANSEA	4909 MILWAUKEE ST	JOHN R & FRANCES M JIMENEZ		4909 MILWAUKEE ST	DENVER	CO	80216	297-0091	280.5	317.3
3872	SWANSEA	4920 MILWAUKEE ST	MARIA BRIZUELA		4920 MILWAUKEE ST	DENVER	CO	80216	296-1210	291.4	345.9
2478	SWANSEA	4932 STEELE ST	RAFAEL ARAUJO LOMELI	DAVID LARA RUIZ	4932 STEELE ST	DENVER	CO	80216	303-308-0799	270.9	114.4
3676	SWANSEA	4935 ADAMS ST	JOSE S & ROSE GARCIA		4935 ADAMS ST	DENVER	CO	80216	2964042	299.6	158.7
2557	SWANSEA	4950 MILWAUKEE ST	GILBERTO LOMELI		4950 MILWAUKEE ST	DENVER	CO	80216	303-296-6191	270.0	364.7
3828	SWANSEA	4965 SAINT PAUL ST	EDMUND C WOLF		11032 WOLFF WAY	WESTMINSTER	CO	80030	469-2521	378.1	313.6
3821	SWANSEA	4995 STEELE ST	RAYMOND SANTOS		4995 STEELE ST	DENVER	CO	80216	296-4537	273.0	264.5
3684	SWANSEA	5044 STEELE ST	FELISA ORTEGA		5044 STEELE ST	DENVER	CO	80216	296-2983	157.7	605.7

Note: Some properties have entries on multiple lines to show details for multiple owners.

APPENDIX B

SAMPLE DOCUMENTS

APPENDIX B-1

ACCESS AGREEMENT

ACCESS AGREEMENT FORM
VASQUEZ BOULEVARD/I-70 SITE
RESIDENTIAL YARD SAMPLING & REMEDIATION

Property Address: _____
Neighborhood: _____
Block & Lot Number: _____

Owner's Name: _____
Telephone: _____
Mailing Address _____
(if different than property) _____
City, State, Zip Code: _____

Tenant's Name (if applicable): _____
Telephone: _____

The U.S. Environmental Protection Agency (EPA) is requesting access to your property to collect soil samples and remove soil that contains elevated concentrations of arsenic and/or lead and may pose a health hazard. The soil will be removed and the excavated area(s) will be replaced with clean materials and restored. This work is being performed under the Vasquez Boulevard/I-70 Superfund Site remediation program.

An EPA representative will contact you in-person to discuss the work to be performed on your property and you will have an opportunity to review and approve the planned soil removal and restoration work before it begins. Once the work is finished you will be asked to review the work and confirm that it is complete and meets with your approval. Upon completion, you will receive written documentation from EPA that your property has been remediated.

By signing this Access Agreement, you are granting the EPA, its employees, contractors and subcontractors the right to enter the property, at all reasonable times and with prior notice, for the sole purpose of performing the work. This access shall remain in effect until the work has been satisfactorily completed. You also agree to:

- Remove obstructions including boats, trailers, vehicles, playscape items, wood piles, dog houses, etc.;
- Remove flower bulbs or plants that you or your tenant may wish to save;
- Water and maintain replacement vegetation, including fertilizer application, as necessary subsequent to an initial watering period by EPA, unless watering is restricted by Denver Water Board;
- Abide by health and safety guidance provided by EPA;
- If the property is rented, assist EPA in obtaining tenant approval for access to the property to perform the work of EPA is unable to obtain such access; and
- Allow videotaping and/or photographing of your property including exterior and interior areas of buildings.

The specific date that your property will be remediated has not been set. EPA will call you once the work schedule has been established.

If you are willing to grant access to EPA, and their contractors, please complete all information below, sign on the signature line and include today's date.

Should you have any questions about this program, please contact _____, EPA, at _____.

I hereby grant access to the property described above to EPA and/or its contractor(s) for the above-mentioned activities.

Resident Signature _____	Date _____
Owner Signature _____	Date _____

_____ I would like to be present during any sampling that is required.

1 copy: Resident
 Owner
 EPA

APPENDIX B-2

REMOVAL ACTION COMPLETION LETTER



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8
999 18th STREET - SUITE 500
DENVER, CO 80202-2466
<http://www.epa.gov/region08>

Ref: 8EPR-SR

<date>

<property owner name>
<property owner address>

Dear <property owner name>:

This letter certifies that soils on the property located at <property address> in Denver, Colorado have been remediated in accordance with the Environmental Protection Agency's (EPA's) Non-Time-Critical Removal Action Memorandum for the Vasquez Boulevard and Interstate 70 Superfund Site, Operable Unit 1, signed by EPA on _____. The required work was accomplished in accordance with EPA approved work plans. The remediation successfully addressed the health risks associated with exposure to arsenic and lead in soils at this property. The remedy is protective of human health and the environment.

You may wish to keep this letter with other important documents. At sites where EPA has required clean up action in residential yards, property owners are sometimes asked to provide proof that their properties have either been cleaned up or required no clean up action. This letter serves that purpose.

Thank you for your cooperation in the clean up project.

Sincerely,

Remedial Project Manager

APPENDIX C

WATER CONSERVATION/MANAGEMENT PLAN

**WATER CONSERVATION/MANAGEMENT PLAN
FOR NON-TIME-CRITICAL REMOVAL ACTION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO**

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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1.0 INTRODUCTION

This document presents the water conservation/management plan for the Off Facilities Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site located in Denver, Colorado. The purpose of this water conservation/management plan is to identify work practices the construction contractors will be required to follow in order to conserve water during removal action activities given the current drought situation in the city of Denver. This plan was specifically developed to address water conservation practices for this project.

1.1 Project Description

The VB/I70 site covers an area of approximately four square miles in north-central Denver, Colorado (see Figure 1-1). The site was divided into three separate areas for remediation purposes. This plan deals with the residential soils portion of the project referred to as Operable Unit 1 (OU1). OU1 is composed of a number of neighborhoods that are largely residential, including Swansea/Elyria, Clayton, Cole, and portions of Globeville.

The objectives of the OU1 removal action are to remove, dispose, and replace soils in 141 residential yards having lead and arsenic concentrations above the site removal action levels. During remediation, the top 12 inches of soil will be excavated, and loaded into trucks for transportation to either a municipal solid or hazardous waste disposal facility or the ASARCO Globe Plant, located at 52nd and Washington. Clean replacement soil will then be hauled in and placed back in the excavation to restore the yard to its original contours. Once the clean soil is in place, the soil will be revegetated or otherwise restored.

This plan was developed to outline the water uses that will be required as part of this remediation, and identify work practices to limit water use wherever possible. As with any remediation project associated with metals-impacted soils, some degree of water use is required. However, with careful consideration, overall water use during the project can be minimized. Required water uses for this project will consist of limited water sprays for dust control during removal of metal-contaminated soil for health

and safety purposes, some limited decontamination of equipment, and watering to establish replacement vegetation. These activities are further discussed in detail in Section 2.

1.2 Summary of Denver Water Drought Response Actions

Denver is currently faced with a drought situation that hasn't been seen in the last 50 years, and 2002 could be the driest year on record. Denver's reservoirs are currently at 45 percent of capacity and dropping, when last year at this time they were at 80 percent. On October 1, 2002, the Denver Water Board, emphasizing the severity of the current drought situation, issued the water use restrictions listed on Table 1. These restrictions are currently enforceable and will remain so until further notice.

Drought response programs have been developed by the Denver Water Board based on different stages of severity. In April, the Denver Water Board will forecast the expected reservoir storage on July 1. The July 1 levels are the key parameter used by the Board in establishing drought stage. Three stages of drought exist. Stage 1 being the mildest, and Stage 3 the severest. The April forecast will essentially determine if Denver will be in a Stage 2, or Stage 3 drought in 2003. The primary threshold between Stage 2 and Stage 3 is whether the forecast July 1 storage is above or below 40 percent.

Under Stage 2, watering of established lawns is restricted. Under Stage 3, watering of established lawns is prohibited. Installation of new seed or sod lawns is prohibited under both Stage 2 and Stage 3. Trees that are currently established may be watered by hand with positive shut off or drip irrigation under either Stage 2 or Stage 3. Restrictions for watering flowers, perennials, vegetable gardens, and shrubs are currently under review. Drought surcharges are currently being imposed to help control excessive and wasteful use of water, and may be increased as a measure to heighten awareness of the current problem. No watering is allowed between the hours of 10 a.m. and 6 p.m., and watering frequencies and durations are being reviewed. Use of fountains and waterfalls is prohibited unless they support aquatic life. If the drought worsens, the aquatic life in these features may be at risk.

1.3 Request for Special Use Permit

As discussed in Section 1.1, limited water use will be required to implement the removal action. However, certain water uses necessary for property remediation, such as washing of equipment and watering of replacement vegetation, are or will most likely be prohibited. Therefore, EPA will request a special use permit from Denver Water to allow limited water usage so that the project may go forward.

The request for a special use permit will include provisions for limited water use for the following purposes:

- Dust control during excavation and handling of metals-impacted soil for worker and resident protection,
- Decontamination of equipment associated with the handling of impacted soil, and
- Watering of replacement vegetation for a period of one month, conducted for fifteen to twenty minutes three times a day.

In order to minimize the overall water use, property restoration plans will be developed for each remediated property. These plans will be prepared in conjunction with the owner and will be designed to promote property restoration using non-vegetative surfaces. For planning purposes, EPA will set a project goal that, on average, less than 50 percent of the original yard area will be restored as lawn. In addition, all excavated City-owned road aprons (areas between sidewalks and streets) will be restored with a non-vegetated, recreational trail-type colored soil and gravel mixture.

The work practices associated with these activities are further discussed in Section 2.

2.0 WATER CONSERVATION WORK PRACTICES

This section presents a summary of work practices to be used during construction activities for the removal action. A more detailed description of all construction activities is presented in the Removal Action Work Plan to which this Plan is an appendix. The work practices listed below will be required of the Construction Contractor.

The project team will consist of the EPA, a Supervising Contractor, a Construction Contractor, and its subcontractors. This project is being lead by the EPA. The EPA is responsible for overall project implementation. The EPA will in turn select a Supervising Contractor who will manage the Construction Contractor and perform field oversight and quality assurance activities. The Construction Contractor will perform the remediation work and will hire specialty subcontractors as necessary.

2.1 Excavation and Backfill

The Construction Contractor will perform all excavation and backfill activities in such a manner as to prevent any off site migration of soils. Excavation techniques will require both powered equipment and hand tools depending on the proximity to existing structures. Accessible soils will generally be excavated to a depth of 12 inches, with care being taken not to generate any dust during construction activities. Water will be used only if absolutely necessary to control visible dust emissions and to meet Total Suspended Particulate Air Quality Standards established by EPA for this project. If water is used to control dust, care will be taken to insure no excess water is used resulting in runoff or the transportation of sediments. Any water used for dust control measures must be measured and recorded by the contractor, and the quantities will be submitted on a daily basis to the Supervising Contractor. Transported materials will be tarped to control the generation of dust. Any material that spills onto work or staging areas will be vacuumed up without the use of water, and disposed with the excavated soils. Limited decontamination of equipment and work areas may require the use of water. If so, this water use will be documented in the same manner as the dust control water use. Care will be taken to insure that no material leaves the work area, or enters the storm sewer system.

Backfill activities will be conducted in a similar manner to excavation activities. Excavated areas will be backfilled with clean replacement materials. Any water used for dust control will be kept to a minimum, and reported daily to the Supervising Contractor. Any material spilled outside of the work area will be vacuumed up without the use of water. In the event clean material is stockpiled prior to placement, the stockpiled material will be stored on a tarp in order to ease in cleanup, and minimize the potential for material to migrate. If stockpiled material is to be left overnight, or for any length of time, the material will be tarped to eliminate the use of water to control dust coming off the pile.

2.2 Restoration

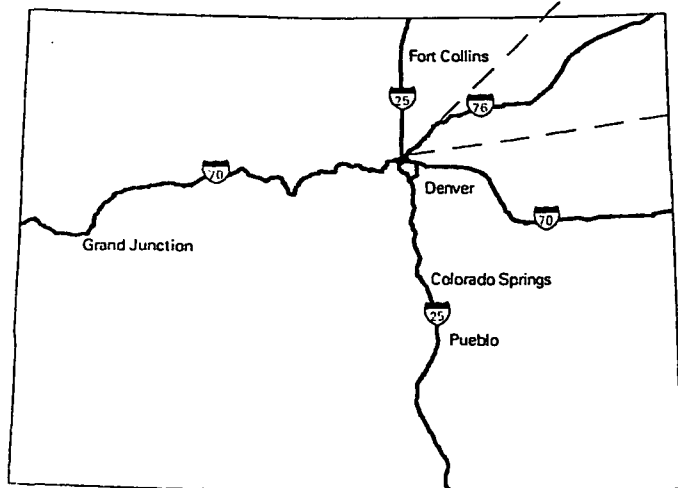
Following backfilling, the excavated areas will be restored in accordance with a restoration plan developed by the Supervising Contractor and the property owner. The Supervising Contractor will develop a menu of alternatives for yard restoration and will discuss these options with the property owner. In developing this menu, the Supervising Contractor will focus on materials and plants that result in water efficient yards. Water efficient yards will be achieved by the following practices:

- Limiting the restored yard to no more than 50% sod or other high water consumption vegetation,
- Recommending drought tolerant plants, if practicable,
- Emphasizing the use of larger mulched areas around replacement trees, and
- Installing decorative gravels, mulch or asphalt pavement in areas previously used for lawn, or bare.

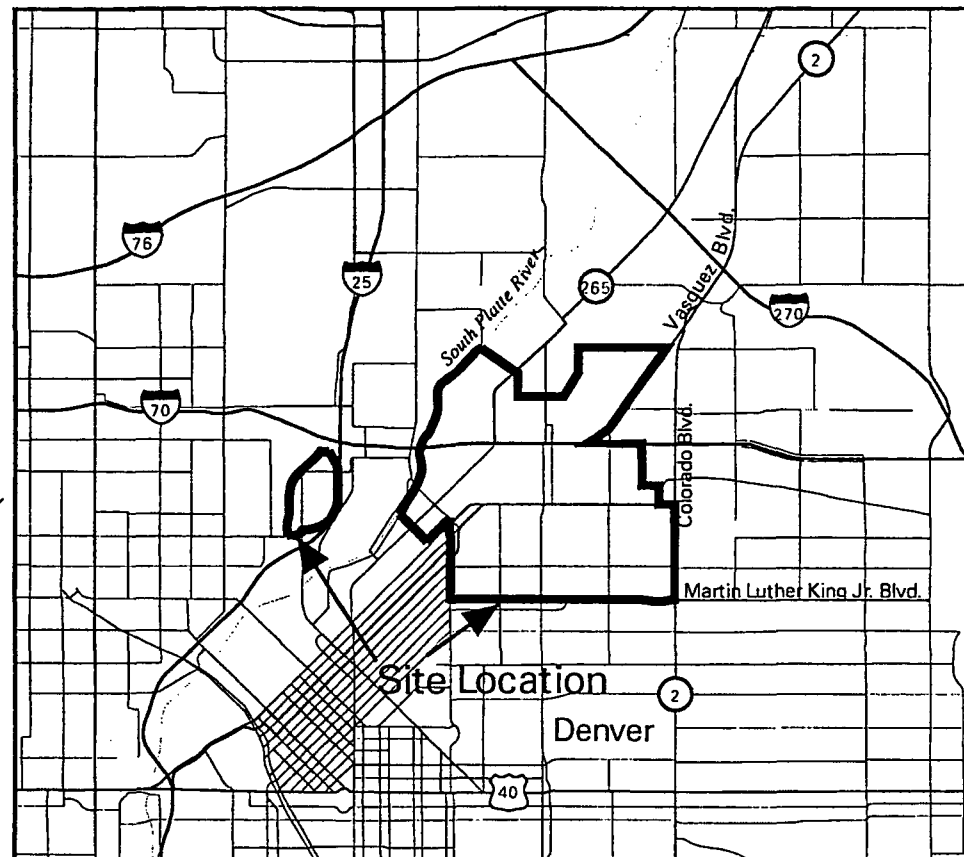
Following property restoration, the Construction Contractor will perform all recommended watering for the establishment of the replacement vegetation for a period of one month. Several quality control actions will be implemented during this watering period. The Construction Contractor will keep track of the amount of water used for each yard, and submit this information daily to the Supervising Contractor for review. Water use monitoring will be tracked by the use of a flow meter on the watering truck. In addition, the Construction Contractor will perform periodic quality checks of its watering applications by placing rain gauges around the vegetation area to verify that the amount of water actually applied does not significantly exceed the amount required. Watering for restoration will not be done between the hours of 10 A.M., and 6 P.M.

Vasquez Boulevard/Interstate 70 Superfund Site
Operable Unit 1
Non-Time Critical Removal Action
Water Conservation/Management Plan

EPA will also work with Denver Water to determine if access to recycled water is available near the project boundaries. If recycled water is reasonably available and is of acceptable quality for residential yard application, EPA will require the Construction Contractor to use recycled water during property restoration.



COLORADO



VB/I70 OU1 VICINITY



U.S. EPA REGION 8 VASQUEZ BOULEVARD/ INTERSTATE 70 SITE OPERABLE UNIT 1		
Figure 1 -1 Site Location Map		
PROJECT: 01-0107x-1	DATE: JULY 31, 2002	
REV: 0	BY: ALB	CHECKED:



DENVER WATER

1600 West 12th Avenue

Denver, Colorado 80204

Phone: 303-628-6000

Fax: 303-628-6349

<http://www.denverwater.org>

DENVER WATER'S WATERING RESTRICTIONS EFFECTIVE OCTOBER 1, 2002

1. NO OUTDOOR WATERING OF TURF AND LAWNS, with the exception of athletic or playing fields, and golf course tees and greens.
2. HAND-WATERING OF VEGETABLE AND FLOWER GARDENS, TREES, AND SHRUBS PERMITTED AT ANY TIME (with positive shutoff nozzle or drip irrigation only).
3. PERSONAL VEHICLES MAY BE WASHED AT HOME ONLY WITH A BUCKET OF WATER. (No time or day restrictions).
4. FLEET VEHICLES MAY BE WASHED ONCE-A-WEEK ONLY BY CARWASHES CERTIFIED BY DENVER WATER.
5. FOUNTAINS AND WATERFALLS ARE PROHIBITED UNLESS THE OPERATION IS ESSENTIAL TO SUPPORT EXISTING FISH LIFE.
6. RESTAURANTS SHALL NOT SERVE WATER AUTOMATICALLY WITH MEALS, BUT MAY SERVE WATER UPON THE CUSTOMER'S REQUEST.
7. LODGING ESTABLISHMENTS SHALL NOT CHANGE SHEETS MORE OFTEN THAN EVERY FOUR DAYS FOR GUESTS STAYING MORE THAN ONE NIGHT.
8. WASHING IMPERVIOUS SURFACES (SIDEWALKS, DRIVEWAYS, ETC.) IS PROHIBITED EXCEPT FOR HEALTH AND SAFETY REASONS.
9. A DROUGHT SURCHARGE WILL BE IMPOSED UNTIL RESERVOIRS REACH 80% FULL.
10. VIOLATIONS WILL CONTINUE TO BE ISSUED: (1st violation is a warning; 2nd is \$100; 3rd is \$300; and 4th and subsequent are \$500, plus a flow restrictor may be installed.)

**FOR IMMEDIATE RELEASE ON
SEPTEMBER 30, 2002**

For details, contact:

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CONSERVE

APPENDIX D

TRANSPORTATION AND DISPOSAL PLAN

**TRANSPORTATION AND DISPOSAL PLAN
FOR NON-TIME-CRITICAL REMOVAL ACTION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO**

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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D-3	Haul Routes to Alternative MSW Disposal Facilities

LIST OF ATTACHMENTS

<u>Attachment</u>	<u>Title</u>
A	Example Documentation Forms

1.0 INTRODUCTION

This Transportation and Disposal Plan (TDP) describes the activities associated with transport and disposal of materials excavated from residential properties in the Off-Facility Soils Operable Unit 1 (OU1) of the Vasquez Boulevard and Interstate 70 (VB/I-70) Superfund Site located in the north-central section of Denver, Colorado. This plan establishes the procedures to be implemented and documentation to be maintained in order to ensure worker and public safety and compliance with applicable laws, rules and regulations. It also establishes procedures to properly document such activities and to avoid the possible release of contaminated materials into the environment during transportation and disposal of excavated soil. This plan is supported by and is an appendix to the Non-Time-Critical Removal Action Work Plan for the Site.

The removal action in the Off-Facility Soils OU1 of the VB/I-70 Superfund Site will include excavating accessible surface soils in residential yards with arsenic and/or lead concentrations above the removal action levels to a depth of 12 inches and restoring the excavated areas with clean material. The selected Construction Contractor will be responsible for the transport and disposal of the excavated materials, using a qualified transporter identified by the Contractor during the bidding process. Contractor and sub-contractor, as applicable, shall be responsible for the safety of the trucks and for all loading and hauling activities associated with transport activities.

The excavated materials will be transported to either the Asarco Globe Plant or an approved licensed municipal solid waste (MSW) disposal facility. Candidate solid waste disposal facilities include: BFI's Tower Road Landfill; the Denver Regional Landfill near Erie, Colorado; the Republic Services/Front Range Landfill near Erie, Colorado; BFI's Foothills/Highway 93 Landfill; and the Waste Management Denver Arapahoe Disposal Site. Prior to commencing the removal action, USEPA will identify whether the excavated material will be disposed at the Globe plant or a licensed solid waste disposal facility.

This Plan has been prepared based on the expectation that the excavated materials will be managed as solid waste. This expectation is based on waste characterization analyses from previous removal actions at the Site during excavation of soil with higher arsenic and lead concentrations. Prior to initiating the current removals, waste characterization sampling and analysis will be performed to confirm this

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Operable Unit 1
Non-Time-Critical Removal Action
Transportation and Disposal Plan

expectation (see Appendix F; Construction Quality Assurance Plan). If the waste characterizations show that a portion of the material cannot be managed as solid waste, this Plan will be amended to incorporate the revised transportation and disposal strategy.

2.0 TRANSPORTATION PLAN

Residential yard materials will be excavated in accordance with the Technical Construction Specifications for the project, and as generally described in Section 4.0 of the removal action work plan. This section of the TDP provides a description of the OU1 areas and transport activities to the alternative disposal facilities.

2.1 SITE AREAS

The boundaries of OU 1 are shown on Figure D-1 and include approximately 4 square miles in north-central Denver. The VB/I-70 OU1 site includes the Elyria, Swansea, Cole, and Clayton neighborhoods and a small portion of Globeville. Materials will be removed from individual properties located within the OU where soil lead or arsenic concentrations exceed the action levels. To provide for worker and public safety, the active work zone and surrounding areas will be visually marked during material excavation and loading. Soils will likely be removed from residential properties within two or more neighborhoods at a time and therefore, the transportation and disposal plan will provide for work within various areas at any given time.

The removal action contractor will be required to determine the condition and availability of public roads, access, rights-of-way, load restrictions and any other limitations affecting transportation of waste materials. Each residential property shall be reviewed for other access requirements affecting loading.

2.2 SITE LOADING AND ASSOCIATED ACTIVITIES

This section presents the material loading and associated activities within OU1. Included are requirements for loading of materials from the properties into haul trucks, truck decontamination, inspection, and documentation for transportation activities.

2.2.1 Loading of Trucks

Excavated materials will be loaded into dump trucks or roll off boxes for transport to the disposal site. Dump trucks or trucks with roll-off boxes will be operated by a licensed carrier. Dump trucks or truck with roll-off boxes will be staged immediately adjacent to each excavation area, or as close as practicable, during loading. If necessary, empty trucks waiting to be loaded may be staged in a safe location down the street such that they do not block the neighboring driveways or alleyways. It is anticipated that in general, one to three residential property soils removals will occur within a neighborhood with another one to three removals being performed within another neighborhood concurrently. Each removal and truck loading area will be subject to the same requirements presented in this TDP.

In the process of positioning the trucks to be loaded, the loader operator will be required to position the truck and to ensure that no pedestrians or vehicular traffic are in the immediate area. When the truck is being loaded, the driver will be required to keep pedestrian and vehicular traffic away from the loading zone. When haul trucks are loaded within or near public traffic-ways such as streets, alleys or sidewalks, traffic cones will be required to direct traffic away from the loading zone.

Trucks and roll off boxes will be loaded in a manner that will minimize spillage of excavated materials. Spilled soil will be isolated by traffic cones as necessary, and will be picked up immediately to minimize any subsequent tracking of materials or run-off of materials into local storm drains. Sediment-control protective devices will be placed around storm drain inlets in the vicinity of all active truck loading operations during potentially wet weather. Loading of trucks will be performed to avoid interference with overhead electrical lines and other potential utility interferences. Dust control will be maintained during loading in accordance with the Fugitive Emissions Dust Control Plan (Appendix E). This may require loading during non-windy periods, or possibly using a limited water spray to minimize fugitive dust emissions during loading.

It is anticipated that haul trucks will require safety beepers when backing up at the loading areas. Such safety beepers will be in compliance with noise limitations and will be in accordance with City/County of Denver regulations. The removal action contractor will provide board or steel ramps and covers where vehicles cross public curbs and sidewalks and will remove such devices at the end of each day.

2.2.2 Inspection and Decontamination

After loading, trucks and roll off boxes will be covered with an adequately secured tarp or other device and inspected for loose/spilled material within the loading zone. Additionally, each truck will be inspected to verify that rear truck bed gates are adequately secured, and that no other potential problems may occur with the trucks such as under-inflated tires, problems with mufflers, leaking fuel or oil and the like.

If loose soil is observed, it will be removed by brushing and scraping in a contained area. In the event that effective decontamination cannot be accomplished by dry methods, a high-pressure wash may be utilized, as necessary to prevent tracking of materials onto public streets and alleyways. If such wheel washing is necessary, contaminated wash water will be contained and treated or disposed of appropriately.

2.2.3 Documentation

The transport of all excavated material to the disposal site will be documented either through use of a non-hazardous waste manifest if the material is shipped to a licensed MSW disposal facility, or a load tracking form if the material is shipped to the Globe Plant. Example non-hazardous waste manifest and load tracking forms are provided in Attachment A.

In addition to documenting the transport and receipt of the materials, the manifest and tracking form provides documentation of the quantity of materials transported. If the materials are shipped to a solid waste disposal facility, the facility will use weigh tickets (loaded weight and tare weight) to verify the quantity received. This information will be added to or attached to the manifest.

If the materials are shipped to the Globe plant, the volume of the shipping container and the number of loads delivered will be used to calculate the quantity of material delivered. Based on requirements presented in the previous residential yard remediation at Globe (Asarco, 1996), the contractor will be required to employ a system to track soils transported to the Globe plant. Such load tracking will include the following: date, material, source (property address), estimated volume, time hauled, driver's signature, placement location on Globe plant and receiver's signature.

2.3 TRANSPORTATION ACTIVITIES

This section presents the transportation activities including transport to the Globe Plant, transportation to potential off-site MSW facilities, traffic control and safety, noise control, emergency response and truck driver requirements.

2.3.1 Site Transportation with Disposal at Globe Plant

Preliminary transport routes within OU1 are shown on Figures D-1 and 2. Transport trucks will generally follow primary streets within the neighborhoods such as 37th, 40th, 45th and 47th Avenues east and west, and Washington, 38th, Fox, Steele and York Streets north and south. Haul trucks will have maps to the disposal site as necessary. When hauling is performed on back streets or alleys, caution will be taken to give all other traffic the right-of-way.

Routing to the Globe plant will follow major streets east or west to Washington Street north to the plant. Access onto the Globe Plant will be from 55th Avenue at the north side of the plant and routes within the plant will be in accordance with Asarco requirements for the particular disposal location on the plant. Trucks leaving the Plant disposal area will be required to stop and yield the right-of-way to other site traffic. Empty truck routes back to the OU1 removal action areas will follow the same route back from the Globe Plant.

2.3.2 Transportation Haul Routes to MSW Disposal Facilities

Trucks traveling to MSW disposal facilities will exit the OU1 neighborhoods onto major highways (I-70 initially and I-25, as necessary) as soon as possible and follow the most direct route to the facility (Figure D-3). The Tower Road MSW Landfill is located approximately 15 to 20 miles northeast of OU1, and haul routes could utilize I-70 east to Pena Boulevard north to Tower Road, or I-25 north to I-76 north to 96th Avenue and east to Tower Road. The Denver Regional and Front Range MSW Landfills near Erie are located approximately 20 to 25 miles north of OU1, and haul routes would likely utilize I-25 north to Colorado State Route 7 west to a local county road north to the facilities. The Foothills/Highway 93 MSW landfill is located approximately 20 to 25 miles northwest of OU1, and haul routes could utilize I-70 west to Colorado 58 through Golden to Highway 93 north to the facility. Alternatively, the haul route could

utilize Colorado Highway 72 from I-70 north through Arvada and west to Highway 93 and the Foothills/Highway 93 facility. The Denver-Arapahoe MSW Landfill is located approximately 20 to 25 miles southeast of OU1, and haul routes would likely utilize I-70 east to E-470 south to Hampden and Gun Club Road to the facility. Empty trucks will return to the active work area by the reverse route. Transport over public roads to the selected MSW disposal facility will comply with the safety requirements of the State of Colorado (CDOT, 1999).

The final transportation route(s) will be identified by the removal action contractor following selection of the disposal site, with approval by USEPA. Transit routes will be selected in such a manner as to minimize impact on local traffic. A map will be located in the work trailer, or base station, indicating current transportation routes. Such maps will be updated as necessary depending upon work locations and disposal sites.

2.3.3 Traffic Control and Safety

Hauling operations will be performed in such a manner to avoid interference with local traffic on city streets. Where required by City and County of Denver or State of Colorado regulations, flag persons and signage will be utilized to provide for public safety. Trucks will generally be limited to speeds of 25 miles per hour (mph) on local residential roads or to the posted speed limits on major arteries and highways. Other truck traffic and safety regulations required by the county or municipality through which waste may be hauled will be followed, as required.

Warning signs, such as "Construction Area" or "Men Working" will be placed on the streets where removals are being performed and haul trucks are being loaded. "Trucks Entering" or "Trucks Turning" signs will be utilized at secondary and primary street intersections as necessary. Any other signage required by local authorities will also be utilized to provide for public safety.

2.3.4 Noise Control

All haul trucks will be required to comply with the requirements of the Colorado Noise Abatement Statute, as presented in the specifications, as will all other construction equipment such as excavators and

loaders. In addition, any local noise ordinances required by Denver or other haul-route jurisdictions will be followed to prevent noise violations during waste transport.

Haul trucks will be maintained as necessary during the course of remediation to provide adequate, functioning mufflers to minimize engine noise. Excessive use of down-shifting to slow the trucks will be avoided to minimize truck noise at intersections within residential areas.

2.3.5 Emergency Response

The OU1 area lies entirely within the jurisdiction of the Denver Emergency Response Service. Potential transportation routes to disposal facilities may lie within various emergency response jurisdictions such as Adams, Arapahoe or Jefferson County. Before removal action work begins, the Supervising Contractor shall notify Denver, and each additional emergency response jurisdiction through which waste may be transported, of the proposed remediation and transportation activities. The removal action base station at OU1 will have an Emergency Response Guide containing a list of emergency numbers along with guidelines to be utilized for properly responding to emergencies.

The Construction Contractor's Construction Superintendent, Site Safety Officer and base station personnel will be in continual contact via cell phone and the truck drivers will have two-way radio contact with the base station. Each truck will contain emergency response guidelines to follow in the event of an emergency such as an accident or spill. Thus, continual contact will be maintained between truck drivers and the site remediation management team during all loading and transportation activities. If any emergency event occurs the truck drivers will immediately call the base station, and personnel at the base station will then immediately call the Site Safety Officer. Depending upon the emergency, the appropriate 9-1-1 call will then be made by the base station or truck driver, as necessary. The removal action contractor Construction Superintendent will notify the Supervising Contractor and USEPA of any emergency response events and subsequent response actions as soon as possible. The removal action contractor will be required to develop a Construction Health and Safety Plan (HASP) prior to beginning field activities. Such HASP will detail additional emergency response actions to be taken in the event of accidents or injuries sustained during remediation.

The Construction Contractor will take immediate response actions in the event of a spill. Such actions will include securing the area and restricting public access to any spilled materials. This may require safety cones in roadways along with safety tape or fence and appropriate signage as necessary. As soon as safely possible, any spilled materials will be picked-up and loaded onto the original or a replacement transport truck for delivery to the disposal site. The contractor shall immediately notify the Supervising Contractor and USEPA of any emergency response events and the subsequent response actions.

2.3.6 Truck and Driver Requirements

Transport trucks and drivers shall comply with all applicable federal, state and local regulations. Drivers shall be licensed to operate the equipment under their control and the drivers will be subject to safety record checks. Transport vehicles shall pass all required safety, emission and noise inspections. Trucks will be inspected for leaks of fluids and fuel and will be checked for potential fire hazards associated with loading equipment and haul trucks. Loaded trucks shall not exceed applicable weight restrictions and the selected transport routes shall be checked for weight-restricted bridges or other load limits prior to initiating transport.

All truck drivers will be responsible for complying with all posted speed limits and other traffic controls on public roads. Unless otherwise posted, trucks shall not exceed 25 mph on residential streets.

Prior to any materials being transported, truck drivers will be briefed regarding the loading, inspection, and documentation requirements and any additional safety procedures specified in the contractor's Construction HASP. All haul trucks will contain guidelines regarding emergency procedures and motor vehicle accident report forms. Completed accident report forms will be submitted to the Site Safety Officer, as necessary.

3.0 DISPOSAL PLAN

This section of the TDP contains information regarding selection of the disposal site, off-loading of materials at the disposal site, and related activities.

3.1 DISPOSAL SITE

Excavated materials will be disposed either at a licensed MSW disposal facility, as described above in Section 1.0, or the Asarco Globe plant north of OU1. The MSW facilities are licensed by the State of Colorado Department of Public Health and Environment (CDPHE) to accept non-hazardous solid waste. The residential yard wastes from OU1 containing non-hazardous levels of arsenic and lead will be designated a special waste for disposal at the MSW facilities. The Asarco Globe Plant contains areas suitable for the disposal of excavated yard soils. USEPA will select the disposal site prior to commencing the removal action. Alternatively, the Construction Contractor may select the disposal site with the approval of USEPA. The selection of disposal site(s) will be dependent upon a number of factors including negotiations with Asarco, availability of various MSW disposal facilities to accept the volumes of materials to be transported, the characteristics of the excavated soil and the costs of hauling and disposal. It is possible that more than one disposal site may be utilized depending upon these factors.

3.2 DISPOSAL PROCEDURES

All disposal activities will follow requirements established at the disposal site including the appropriate documentation, weigh-in and weigh-out procedures, and off-loading procedures. As described in Section 2.2.3, each shipment of materials delivered to the disposal site will be documented using either a non-hazardous waste manifest or tracking form, as applicable.

The following procedure will be used for transport to a MSW disposal facility. Upon arrival at the disposal site, the truck will be weighed and the weight recorded on the manifest form. The truck driver will then proceed to the unloading point and unload the truck or container. Truck drivers will be required to follow all instructions and signs at the disposal site to ensure proper unloading of the materials. After each truck has been unloaded, it will be re-weighed, and the facility scale operator will record the tare

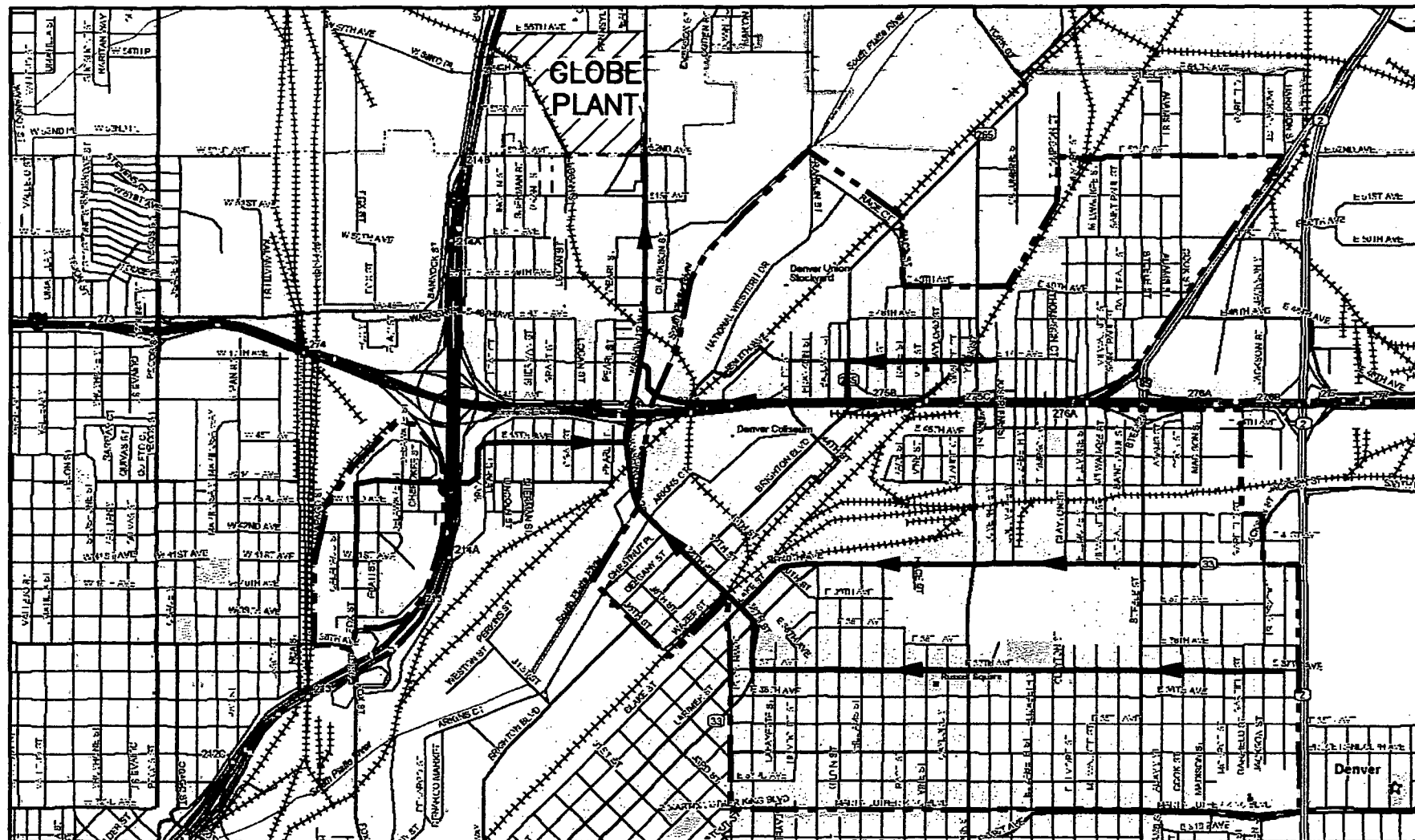
weight on the manifest form. The scale operator will then sign the manifest form, and a copy of the manifest will be removed and retained for their records.

For disposal at the Globe plant, truck drivers shall enter the plant area at the designated entrance, proceed to the designated unloading point and unload the truck or container. Drivers shall abide by the posted speed limits at the Globe plant and follow any other instructions or posted requirements. Truck traffic shall be coordinated with plant activities to minimize impacts on existing plant operations. Asarco may also require limited spreading of deposited yard soil wastes within an area. The Construction Contractor may also be required to install temporary haul roads along with associated temporary gravel and drainage features if required on the Globe Plant. If these conditions become necessary, the Construction Contractor would have bulldozers, graders or other equipment at the Globe Plant temporarily to construct access roads and to spread wastes as necessary.

4.0 REFERENCES

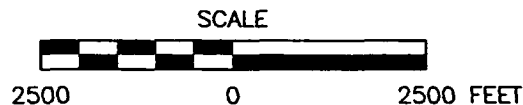
- Asarco, 1996. Prefinal Soil Remediation Specifications Community Soils and Vegetable Gardens Operable Unit, Asarco Globe Plant Site, Denver, Colorado.
- Colorado Department of Transportation (CDOT), 1999. Standard Specifications for Road and Bridge Construction.

FIGURES

**LEGEND:**

--- SITE BOUNDARY

→ ROUTES TO GLOBE PLANT



U.S. EPA REGION VIII
VB/1-70 SUPERFUND SITE - OPERABLE UNIT 1
TRANSPORTATION AND DISPOSAL PLAN

FIGURE D-1

**TRANSPORTATION ROUTES TO
 GLOBE PLANT**

PROJECT: 010107.X DATE: AUGUST 2002

REV: BY: SCG CHECKED: DEP

MFG, Inc.

consulting scientists and engineers



 ROUTES TO GLOBE PLANT



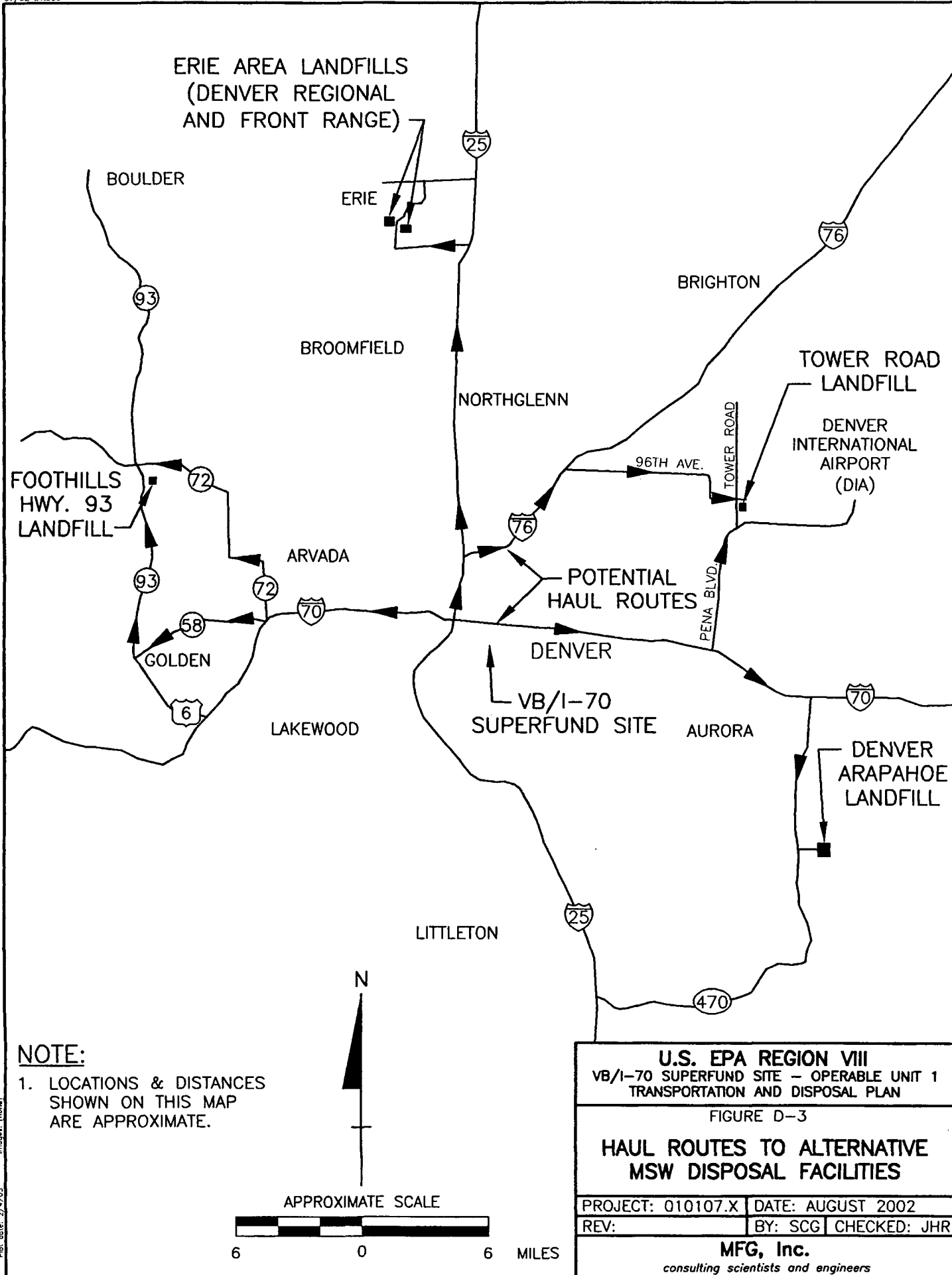
2500 FEET

TRANSPORTATION ROUTES TO SOLID WASTE DISPOSAL FACILITIES

REV:	BY: SCG	CHECKED: DEP
------	---------	--------------

MFG, Inc.

consulting scientists and engineers



RFELO D:\010107-X\0107-3.dwg 010107.X 2/4/03 1:00 pm
 Plot time: 1/30/03
 File size: 2/4/03

ATTACHMENT A

Example Documentation Forms

NON-HAZARDOUS WASTE MANIFEST		WWM WASTE MANAGEMENT		254844	
1. Generator's Name and Project Location				2. Bill to:	
1a. Generator's Phone				2a. Account #	
3. Transporter 1 Company Name				3a. Transporter's Phone	
4. Transporter 2 Company Name				4a. Transporter's Phone	
5. Designated Management Facility Name and Site Address				5a. Facility's Phone	
6. Waste Code/Profile #	Waste Description			Quantity	Units
IF ASBESTOS WASTE (Please check the appropriate box)					
Waste Code/Profile #	Waste Description			Quantity	Units
	<input type="checkbox"/> Friable	RQ Asbestos Class 9 NA 2212 PG III			
	<input type="checkbox"/> Nonfriable Asbestos				
7. Regulatory Agency: Colorado Department of Public Health and Environment 4300 Cherry Creek Drive South Denver, CO 80222-1530				Emergency Notification: CHEMTREC (800) 424-8300 24 hr. toll free phone number	
8. Contractor/Generator Certification: I hereby certify that the above described waste is not a hazardous waste as defined by federal, state or local regulations and does not contain regulated quantities of PCB's or radioactive materials. This waste has been accurately classified, described, packaged, marked and labeled and is in proper condition for transportation according to applicable international and governmental regulations.					
Printed/Typed Name			Signature		Month Day Year
9. Transporter 1 Acknowledgement of Receipt of Materials					
Printed/Typed Name			Signature		Month Day Year
10. Transporter 2 Acknowledgement of Receipt of Materials					
Printed/Typed Name			Signature		Month Day Year
11. Discrepancy Indication Space					12. Ticket #
13. Management Method/Location <input type="checkbox"/> Solidification <input type="checkbox"/> Monofill <input type="checkbox"/> Landfill <input type="checkbox"/> Bio-Beds					
Grid Location (if applicable): _____					
14. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 11.					
Printed/Typed Name			Signature		Month Day Year

GENERATOR

TRANSPORTER

FACILITY

ORIGINAL - RETURN TO GENERATOR

Load Tracking Form

**VASQUEZ BOULEVARD/INTERSTATE I-70
SUPERFUND SITE**

Date: _____

[illegible]

Total Volume	
--------------	--

APPENDIX E

FUGITIVE EMISSIONS DUST CONTROL PLAN

**FUGITIVE EMISSIONS DUST CONTROL PLAN
FOR
NON-TIME-CRITICAL REMOVAL ACTION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
DENVER, COLORADO**

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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3	Action Levels

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<u>Attachment</u>	<u>Title</u>
A	Standard Operating Procedures for Real-time Dust Monitoring
B	Standard Operating Procedures for Portable Dust Monitoring

1.0 INTRODUCTION

This document presents the Dust Control Plan for remediation of residential properties in Operable Unit 1 of the Vasquez Boulevard/Interstate 70 (VBI70) Superfund Site located in Denver, Colorado. This Dust Control Plan complies with the Applicable or Relevant and Appropriate Requirements (ARARs) identified in USEPA's Non-Time-Critical Removal Action Memorandum (USEPA, 2003). More specifically, it is intended to meet the applicable requirements of Regulation Nos. 1 and 8 of the Colorado Air Pollution Prevention and Control Act.

2.0 MONITORING APPROACH

During the course of removing soils from residential properties, movement of equipment and vehicles in work areas may liberate dust containing lead and arsenic, particularly in dry and windy weather conditions. The primary concerns with respect to dust are compliance with the State and Federal air quality standards and protecting residents from unacceptable levels of arsenic or lead. The Colorado Ambient Air Quality Standard (CAAQS) in Regulation 8 requires that ambient lead concentrations not exceed $1.5 \mu\text{g}/\text{m}^3$ averaged over a 30-day period. The National Ambient Air Quality Standard (NAAQS) is less restrictive in that it requires that the ambient lead concentration not exceed $1.5 \mu\text{g}/\text{m}^3$ over a three-month period. State and Federal standards for particulate matter formerly based on total suspended particulate (TSP) concentrations have been replaced by NAAQS standards for particulate matter less than 10 microns (PM_{10}) and less than 2.5 microns ($\text{PM}_{2.5}$) in diameter. Those standards require that PM_{10} concentrations not exceed $150 \mu\text{g}/\text{m}^3$ and $\text{PM}_{2.5}$ concentrations not exceed $65 \mu\text{g}/\text{m}^3$ based on a 24-hour average. Average annual PM_{10} and $\text{PM}_{2.5}$ standards are 50 and $15 \mu\text{g}/\text{m}^3$, respectively. There are no air quality standards for arsenic.

The effectiveness of dust control measures in meeting these standards will be evaluated using real-time monitoring equipment that measures TSP concentrations and laboratory analysis of dust samples for TSP, arsenic and lead. The real-time monitoring equipment will be used to determine the immediate effectiveness of fugitive dust control measures. Exceedances of the established action levels for TSP will trigger the implementation of additional dust control measures or temporary suspension of activities. At the same time, filter samples of the ambient dust will be used to document compliance with the standards given above; help identify the source and nature of the dust; and assess the potential for offsite, airborne transport of arsenic and lead.

In the urban setting of the VBI70 site, it is likely that background sources will contribute PM_{10} and $\text{PM}_{2.5}$ to the air at levels that approach the NAAQS. Therefore, use of TSP as a direct measure of PM_{10} and $\text{PM}_{2.5}$ concentrations would likely be too conservative and result in dust control activities and work stoppages that were caused by sources not related to the removal action. To allow for real-time TSP data to be used over the long-term, an initial monitoring effort will be performed to provide data to correlate TSP, PM_{10} , and $\text{PM}_{2.5}$ concentrations. In addition, a background monitor will be operated to provide data

on urban air quality not affected by the removal action. When background conditions are contributing significantly to exceedences of air quality action levels at the remediation sites, the Supervising Contractor will apply professional judgment on the need for additional remedial dust control actions (such as increased water application) and may allow removal action activities to continue if background air quality is believed to be the major problem.

2.1 Monitoring Activities

Air monitoring activities will be implemented to measure TSP concentrations and collect samples at representative locations around the active working area(s). TSP samples will be submitted to an offsite laboratory for analyses of lead and arsenic. The placement of samplers and essential elements of the monitoring activities are described below.

2.1.1 Monitoring Equipment and Parameters Measured

Real-time monitoring of ambient TSP concentrations at each residential site will be conducted with a personal DataRAM (referred to as a MiniRAM) manufactured by MIE, Incorporated, or equivalent. The MiniRAM is a miniature real-time aerosol monitor/data logger that is able to measure dust concentrations over a range of 0.001 to 400 mg/m³. The MiniRAM is equipped with an audible alarm that sounds whenever a user-specified level is exceeded. The two-line LCD continuously displays real-time and time-weighted average (TWA) concentration values.

Filter samples of the ambient dust will be collected with an Airmetrics MINIVOL sampler, or equivalent. A MINIVOL sampler draws ambient air at a rate of 5 liters per minute through a pre-weighed 47-mm Teflon filter, where the particles are deposited. The portable MINIVOLs are compact, lightweight, battery-operated, and constructed from durable PVC.

The MINIVOLs will sample TSP. Although PM₁₀ and PM_{2.5} inlets are available, the TSP particle size fraction is preferred primarily because of the coarse, mass distribution of fugitive dust; and the lead NAAQS is based on the TSP size fraction. Exposed filters will be delivered to the analytical laboratory for final gravimetric analysis and laboratory analysis for lead, and arsenic. The average concentration of the

constituents over the monitoring period will be calculated by dividing the mass values for TSP, lead, and arsenic by the volume of air sampled. TSP concentrations will be corrected to account for the estimated $PM_{2.5}$ and PM_{10} fraction (determined during the initial monitoring phase; see Section 2.1.2) and these estimates will be compared to the NAAQS.

A non-data-logging wind speed and direction monitor will be placed at the MINIVOL location. Readings from the monitor will be recorded on the MiniRAM Monitoring form (contained in Attachment A). This method will be used instead of a windsock located at the site, because previous removal actions found that local wind directions were often different between the central monitoring location and the property being remediated (URS, 1998).

2.1.2 Initial Monitoring Period

The initial monitoring period will consist of the first 20 work-days when construction and air monitoring activities are performed. Air quality data generated during the initial monitoring period will be used to generate correlations between PM_{10} and $PM_{2.5}$ and TSP.

During the initial monitoring period three MINIVOL samplers will be co-located to provide data on TSP, PM_{10} and $PM_{2.5}$. At least 20 co-located samples will be collected and a linear correlation developed to allow for estimation of PM_{10} and $PM_{2.5}$ levels based on TSP concentrations. Using these data a linear correlation will be developed for PM_{10} and $PM_{2.5}$ concentrations and TSP concentrations using the least squares method. For each parameter, the 95th percent upper confidence limit of the slope will be used to define the relationship between PM_{10} and $PM_{2.5}$ concentrations and TSP concentrations. For example, for $PM_{2.5}$:

$$PM_{2.5} \text{ concentration} = B_1 * \text{TSP concentration} + b_0$$

Where B_1 is the slope of the correlation at the upper 90% prediction interval (i.e., 90 percent of measurements will be below the predicted value) and b_0 is the estimated intercept.

Once the correlation parameters have been determined, they will be used to back-calculate a TSP action level that corresponds to the $PM_{2.5}$ NAAQS ($65 \mu\text{g}/\text{m}^3$):

$$\text{TSP Action Level (PM}_{2.5}\text{)} = (65 - b_0) / B_1$$

The same approach would be taken for PM₁₀ and the TSP action level implemented would be the lower of the two calculated for PM_{2.5} and PM₁₀.

2.1.3 Sampling Real-time TSP Concentrations

The MiniRAM monitor will be used to measure any generation of dust during remediation activities that disturb yard soils (i.e., soil removal and excavation) to determine the immediate effectiveness of dust control measures. The Supervising Contractor will be responsible for operating the MiniRAM unit and documenting monitoring activities. The unit will be calibrated, zeroed, operated, and maintained in accordance with the manufacturer's specifications. The procedure used for the placement and operation of the MiniRAM sampler is summarized below and detailed in the Standard Operating Procedure (SOP) entitled REAL-TIME DUST MONITORING (see Attachment A).

Location

One MiniRAM sampler will be placed within or on the boundary of the work area (typically at the property boundary of the area of soil disturbance. The Supervising Contractor will reference the non-data-logging wind speed and direction monitor to determine the local wind direction and then place the sampler accordingly. The MiniRAM may be periodically relocated so as to remain generally downwind of dust generating activities. The time and location of placement will be noted on the appropriate Dust Monitoring Form (see SOPs in Attachment A). The MiniRAM unit will be removed at the conclusion of each workday. In addition, a background sampler will be operated within the site, but in a location that would not be affected by removal action activities, as selected by the Supervising Contractor.

Procedure

MiniRAM samplers will be operated every workday at each residential property where soil remediation is performed. Real-time monitoring will be performed on the workdays when removal action activities disturb soils on the property; real-time monitoring will not be performed on days when there is no soil disturbance.

At the beginning of each workday, the MiniRAM units will be zeroed according to the manufacturer's instructions. After zeroing, one MiniRAM will be placed downwind of dust generating activities and the time, location, and wind direction will be noted on the Dust Monitoring Form (included in SOP for REAL-TIME DUST MONITORING). The unit will be programmed to store one-hour average concentrations. Four times a day, the Supervising Contractor will interrogate the MiniRAM and note the previous hourly averages on the Dust Monitoring Form. Any time the unit is interrogated, the Supervising Contractor will note the time checked, the location, and the wind direction for reporting purposes.

Quality Assurance and Quality Control

Each MiniRAM is gravimetrically calibrated (NIST-traceable) in mg/m^3 using standard SAE fine (ISO Fine) test dust. The internal software has an automatic calibration check referenced to the optical background that is set at the factory. This optical background is near the wavelength of natural soil. Therefore, it should be representative of soil work in the residential areas. However, at the beginning of the program, a gravimetric field calibration will be performed by placing the MiniRAM next to the MINIVOL and comparing the TSP concentration results. If a significant difference exists, the MiniRAM's calibration constant will be changed accordingly.

At the beginning of each day, the units will be zeroed according to the procedure described in the MiniRAM instruction manual. Zeroing with particle free air is accomplished quickly and effectively under field conditions using the zeroing kit included.

2.1.4 Sampling for TSP and Metals Concentrations

The portable MINIVOL samplers will be used to evaluate TSP, arsenic, and lead concentrations at the boundaries of each residential site. Boundary sampling will be used to evaluate compliance with the lead CAAQS and the PM_{10} and $\text{PM}_{2.5}$ NAAQS and to provide information about arsenic concentrations. The MINIVOL samplers will be calibrated, operated, and maintained in accordance with the manufacturer's specifications and the SOP entitled PORTABLE DUST MONITORING (see Attachment B).

Location

The Supervising Contractor will determine the location of the MINIVOL sampler the night before removal action activities begin at a property. Samples will be collected within or on the boundary of the work area. The location is dependent on the prevailing wind direction and location of removal action activities.

The Supervising Contractor will use the prevailing wind direction data from the non-data-logging wind speed and direction monitor, local weather forecasts, and site experience to select the sampling locations.

The unit will be placed on tripod/mast assemblies and elevated to approximately 2 meters above the ground surface. The intake will be positioned at least 30 centimeters from any obstacle to airflow. The sampler will then be secured to the ground using stakes.

Procedure

The MINIVOL samplers will be operated each workday that soil remediation is being performed. The MINIVOL sampler will be operated at a property selected by the Supervising Contractor where contaminated soil is disturbed (e.g., soil removal, regrading, etc.). If no properties are having soil excavated, then a property where backfilling activities are being performed will be monitored. Twenty-four-hour samples will be collected commencing the midnight before onsite activities with shutoff 24 hours later.

Gravimetric analysis of the MINIVOL filters for mass concentration will follow USEPA guidance for TSP and lead (40 CFR Part 50, Appendix G). Teflon or other filter media with extremely low metal impurities will be conditioned in a controlled environment then pre-weighed by the analytical laboratory on a balance sensitive to 10 µg. Immediately prior to use, each filter will be placed in the filter holder assembly and attached to the sampler. A recharged battery will then be installed and the timer will be programmed for 24-hour operation. The filter assembly will be collected the next workday following the end of the 24-hour sampling period. Each filter will be inserted and removed from the filter assembly in a sheltered location to prevent potential sample loss from wind or other activity. The filter will be stored in a safe location pending submittal to the laboratory for analysis.

Quality Assurance and Quality Control

To assure the sampler has an ambient flow rate of 5 liters per minute and that there is consistent performance of the TSP inlet, a new, corrected indicated flow rate must be established for this Dust Control Plan. The procedure accounts for the differing air temperatures and atmospheric pressures due to elevation and seasonal changes. Before the start of the program each MINIVOL will have a six-point calibration to calculate the flow rate based on the ambient conditions. The six-point calibration will be repeated as an audit at the beginning and end of each construction season or at 6-month intervals, whichever is more frequent, thereafter. The six-point calibration/audit will be performed in a manner consistent with the MINIVOL User's Manual.

A single-point calibration check will be performed once every month and at the first sign of the following warning lights: low flow threshold indicator and low flow cutoff indicator. The single-point calibration will be performed in a manner consistent with the User's Manual.

Typical maintenance and cleaning procedures also will be performed as required in the User's Manual. These include cleaning the flow meter, checking pump valves and diaphragms, cleaning the rain hat and filter assembly, checking the tubing and fittings, and checking the battery charge.

Once a week during removal action activities, the group of filters collected during that week will be delivered to the laboratory. A chain of custody (COC) form will be included with each batch. Every tenth sample will be accompanied by a filter blank. After conditioning and weighing, the laboratory will analyze the filters using the modified USEPA reference method for lead based on inductively coupled plasma-atomic emission mass spectrometry (ICP-MS, SW-846 Method 6020). Although the original USEPA reference method calls for Graphite Furnace Atomic Absorption (GFAA) for lead, ICP-MS has a comparable detection limit, that is less subject to matrix interference, and can be used for multiple metals. After the digestion, each sample extract will be analyzed for arsenic and lead. Based on expected ICP-MS detection limits, a 5 liter per minute sample rate and a 24-hour sampling period, the method detection limits are expected to be 7 ng/m³ for lead, and 21 ng/m³ for arsenic.

The analytical laboratory will follow Quality Assurance (QA) and Quality Control (QC) measures, such as calibrating and auditing laboratory equipment, duplicate weighing, field blanks, solution spike,

solution duplicate, reagent spike, laboratory control sample, data validation, and flagging, required by their Quality Assurance Plan and USEPA's SW-846 Method 6020 (ICP-MS). The results of the laboratory analysis will be provided no later than ten days after delivering the filter group.

The TSP, lead and arsenic sampling methods will be assessed for precision and accuracy. Precision will be evaluated by comparing the monitoring results of two co-located samplers. Once every month, two MINIVOLs will be placed within 2 meters of each other for one sample day. The absolute difference of the co-located samples should not exceed $5 \mu\text{g}/\text{m}^3$ when the mass concentrations are below $80 \mu\text{g}/\text{m}^3$ and a fractional bias of 7 percent for concentrations above $80 \mu\text{g}/\text{m}^3$. The accuracy of the measurements will be addressed based on audits performed by the Supervising Contractor after the monitoring program begins, at six-month intervals, and at the program's conclusion.

2.1.5 Meteorological Monitoring

Wind velocity at each residential property will be measured using a non-data-logging wind speed and direction monitor (such as a hand-held anemometer) to ensure that work is not conducted in wind conditions that exceed 30 mph. At the beginning of the workday and throughout the day when data are collected from the MiniRAM (as described above), the wind speed will be measured and recorded. If wind gusts exceed 30 mph, the Supervising Contractor will order work to stop. Work will resume when a 15-minute period has passed in which no wind speeds over 30 mph are measured. Any dust-related shut downs will be noted in the Dust Monitoring Form.

The wind direction will be estimated using a non-data-logging wind speed and direction monitor placed in the property being remediated. At the beginning of the workday and throughout the day when data is collected from the MiniRAM (as described above), the wind direction will be measured and recorded in the Dust Monitoring Form.

2.1.6 Personal Exposure Air Monitoring

Personnel working at the Site, particularly those in areas near active operations, could potentially be subject to airborne lead levels that exceed Occupational Safety and Health Administration (OSHA)

exposure limits. Personal monitoring will be conducted in accordance with the project Construction Health and Safety Plan (CHASP) to assess workers' exposure to airborne dust. To accomplish this assessment, personal air sampling pumps will be worn by a typical worker in each job type for a total of three consecutive workdays. Personal air monitoring will be performed on the same days as the real-time TSP monitoring activities described above. Details of personnel air monitoring will be detailed in the Health and Safety Plan prepared by the Construction Contractor.

2.1.7 Reporting

The results of air monitoring at individual properties will be included in the routine monthly reports. The reports will include monitoring and laboratory analysis results; field and laboratory quality assurance information; results for QC analyses of blanks, duplicates and spike samples. Calculations performed to determine flow rate will also be provided.

3.0 FUGITIVE DUST ACTION LEVELS AND CONTROL MEASURES

This section outlines the dust control practices that will be followed during removal action activities and the action levels for more aggressive dust control measures and possible cessation of activities. Controls will be implemented to minimize fugitive dust generation from excavation activities. Visual observations, real-time monitoring and samples collected at the site perimeter will be used to evaluate the effectiveness of the controls. Decisions to implement more aggressive controls or to temporarily cease activities will be based on pre-defined action levels. The remainder of this section describes the criteria that will be used and provides an overview of the expected dust control practices.

3.1 Dust Control Measures

Dust control measures will be a high priority for removal action personnel. To minimize the off-site migration of airborne dust, removal actions will include aggressive dust control measures to minimize the potential for the dispersion of lead, arsenic, and suspended particulate matter. Dust control will be achieved primarily by watering down work areas and vehicle traffic routes. Watering will be provided on an as-needed basis, as follows:

- During soil excavation activities (by heavy equipment and by hand crews);
- During stockpiling and/or loading of soils for transport; and
- To wet down truck loads to prevent any visible emissions during transport (truck loads will also be covered when traveling public roads).

Additional dust control measures will be implemented in response to TSP concentrations measured above the action levels specified below. Additional dust control measures will be aggressively implemented under arid or windy conditions, whenever dust plumes are observed leaving the residential property or as needed to address real-time TSP measurements. Dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Other dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of

surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

Dust control alternatives may be re-evaluated, on an as-needed basis, in consultation with USEPA.

3.2 Action Levels

Action levels for more aggressive dust control measures and possible cessation of activities will be based on both visual observations and data from the monitoring program. During the course of removing soils from residential properties, the Supervising Contractor will alert operations personnel when visible fugitive dust is observed. Visual observations of fugitive dust plumes will trigger more aggressive controls. Should generation of visible dust plumes continue after the additional dust mitigation measures have been implemented, work will stop until conditions abate or additional measures will be taken to reduce dust generation and airborne transport.

The Supervising Contractor will check the MiniRAM sampler four times a day during removal action activities for the following: instrument status and previous hourly averages. In addition to the visual observations, these records will allow on-site personnel to employ pro-active measures to protect against a violation of the 24-hour $PM_{2.5}$ and PM_{10} ambient air quality standards. Initial action levels for TSP as measured by the MiniRAM are summarized in Table 3. These will be revised based on the findings of the initial monitoring effort (see Section 2.1.2).

A concentration of $100 \mu\text{g}/\text{m}^3$ will be used as the initial action level for TSP measured by the MiniRAM. Any 15-minute average concentration over $100 \mu\text{g}/\text{m}^3$ will necessitate additional dust mitigation. If levels exceed the $100 \mu\text{g}/\text{m}^3$ action level an alarm will sound on the MiniRAM. The Construction Contractor will then implement additional dust control measures (see previous section). After additional controls are implemented, the Supervising Contractor will take a downwind, 15-minute, time-weighted average concentration. If this successive TSP measurement is below $100 \mu\text{g}/\text{m}^3$ the added mitigation measures may be discontinued. If mitigation measures are unsuccessful and result in

concentrations greater than $150 \mu\text{g}/\text{m}^3$ then work will stop. Work will be allowed to resume only if a downwind 15-minute average concentration is less than the $100 \mu\text{g}/\text{m}^3$ action level.

As stated above, a wind speed of 30 mph will also trigger mitigation activities. If wind gusts exceed 30 mph, the Supervising Contractor will order work to stop. Work will resume when a 15-minute period has passed in which no wind speeds over 30 mph are measured. Any dust-related shut downs will be noted in the Dust Monitoring Form.

The action levels shown above are expected to provide protection for lead and arsenic, because calculations show that when TSP action levels are exceeded, both lead and arsenic concentrations in air are predicted to be at least an order of magnitude lower than their respective action levels. Approximately 3,000 of the 4,000 properties at the site have been sampled (Washington Group, 2001). The highest lead concentration (average value for a single residential yard) found was 1,130 mg/Kg. Using this value, a TSP concentration of $100 \mu\text{g}/\text{m}^3$ would correspond to a lead air concentration of $0.044 \mu\text{g}/\text{m}^3$. Therefore, dust control measures will be implemented due to an exceedence of the TSP action level when lead concentrations are an order of magnitude or more lower than the NAAQS of $1.5 \mu\text{g}/\text{m}^3$ (because the maximum lead concentration in soils was used for the calculation). For arsenic, there are no Federal or State air quality standards. However, as a point of reference, CDPHE has established fence line air quality criteria for remediation at the Rocky Mountain Arsenal. For arsenic the Acute Reference Concentration is $2.8 \mu\text{g}/\text{m}^3$ (CDPHE, 2002). The Acute Reference Concentration is defined as an allowable air concentration, based on animal and/or human toxicity data, derived with the intent of negligible potential health impacts to the public. Any reports of measured concentrations exceeding the Acute Reference Concentration require work modifications to reduce emissions. For the VB/I70 site the highest measured concentration of arsenic (measured as an property-wide exposure point concentration) was approximately 1,500 mg/Kg. Using this value, a TSP concentration of $100 \mu\text{g}/\text{m}^3$ would correspond to an arsenic concentration of $0.06 \mu\text{g}/\text{m}^3$. Therefore, as for lead, dust control measures will be implemented due to TSP levels when arsenic concentrations are over an order of magnitude lower than the reference concentration (because the maximum arsenic concentration in soils was used for the calculation). Action levels for lead and arsenic are shown on Table 3.

4.0 MONITORING PROGRAM REVIEW AND MODIFICATION

Upon collection of sufficient monitoring data from a variety of soil remediation work areas/properties, data may be reviewed to evaluate the relative contributions from removal action activities and seasonal variations to the TSP levels measured during work activities. The evaluation will consider potential contributions from excavation activities, comparison of results with the MiniRAM data and medical monitoring results. If these results indicate that real-time dust monitoring could be performed less frequently while still providing sufficient data to demonstrate compliance with the air quality standards (CAAQS for lead and NAAQS for $PM_{2.5}$ and PM_{10}), then a request for less frequent monitoring may be made to USEPA. Similarly, if a representative number of samples measure low TSP concentrations (below the established action level) and/or lead and arsenic concentrations well below their action levels, the frequency of sample collection from the MINIVOL sampler may be re-evaluated with a request for a reduction in frequency if it can be demonstrated that a lower frequency will provide sufficient data for documenting compliance. Changes in the frequency of monitoring and sampling will not be made without prior approval from USEPA.

5.0 REFERENCES

CDPHE, 2002. Rocky Mountain Arsenal Medical Monitoring Program.
<http://www.cdphe.state.co.us/rma/rmahom.asp>

USEPA, 2003. *Non-Time Critical Removal Action at the Vasquez Boulevard/Interstate 70 Environmental Justice NPL Site, Denver County, Denver Colorado.*

USEPA, 2001. *Feasibility Study Report Vasquez Boulevard/Interstate 70 Superfund Site.*
Prepared by MFG, Inc.

URS Operating Service, Inc., 1998. *Removal Summary Report Vasquez Boulevard and I-70 Denver Colorado.* Prepared for the USEPA.

Washington Group, 2001. *Remedial Investigation Report Vasquez Boulevard/I-70 Site Operable Unit 1.*
Prepared by Washington Group International for the USEPA.

TABLES

TABLE 1

**SUMMARY OF CHEMICAL-SPECIFIC ARARs PERTINENT TO DUST CONTROL ACTIVITIES
VB/I-70 OUI**

Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comment
FEDERAL					
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standard is: 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with the removal action would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to lead are relevant and appropriate.
STATE					
Colorado Air Pollution Prevention and Control Act	Yes	--	5 CCR 1001-14;	Applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQS.	Construction activities associated with removal actions at the site would be limited to generation of fugitive dust emissions. Colorado regulates fugitive emissions through Regulation No. 1. Compliance with applicable provisions of the Colorado air quality requirements would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.
	No	Yes	5 CCR 1001-10 Part C (I) Regulation 8	Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The removal actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 2

SUMMARY OF ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments
Air Emission Control 1. Particulate emissions during excavation and backfill.	Yes	--	5 CCR 1001-3, Regulation 1, Section III (D) 5 CCR 1001-5, Regulation 3 5 CCR 1001-2, Section II	Colorado air pollution regulations require owners or operators of sources that emit fugitive particulates to minimize emissions through use of all available practical methods to reduce, prevent, and control emissions. In addition, no off-site transport of particulate matter is allowed. A fugitive dust control measure will be written into the workplan in consultation with the state for the removal activity.	Applicable to alternatives where soil is excavated, moved, stored, transported or redistributed.
2. Emission of hazardous air pollutants.	No	Yes	5 CCR 1001-10, Regulation 8	Emission of certain hazardous air pollutants is controlled by NESHAPs. Excavation and backfill of soils could potentially cause emission of hazardous air pollutants. Regulation No. 8 sets emission limits for lead from stationary sources at 1.5 micrograms per standard cubic meter averaged over a one-month period.	Regulation is for stationary sources and is therefore not applicable. However, it is relevant and appropriate. Applicants are required to evaluate whether the proposed activities would result in an exceedance of this standard. The removal actions at the site are not expected to exceed the emission levels for lead, although some lead emissions may occur. Compliance with the requirements of Regulation No. 8 would be achieved by adhering to a fugitive emissions dust control plan prepared in accordance with Regulation No. 1. This plan will discuss monitoring requirements, if any, necessary to achieve these standards.

TABLE 2 (CONTINUED)

SUMMARY OF ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments
3. Air emissions from diesel-powered vehicles associated with excavation and backfill operations.	Yes	--	5 CCR 1001-15, Regulation 12	<p>Colorado Diesel-Powered Vehicle Emissions Standards for Visible Pollutants apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways, and state as follows:</p> <ol style="list-style-type: none"> 1) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing 7,500 pounds and less, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity. 2) No person shall emit or cause to be emitted into the atmosphere from any diesel-powered motor vehicle weighing more than 7,500 pounds, empty weight, any air contaminant, for a period greater than five (5) consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 35% opacity, with the exception of subpart "C". 3) Any diesel-powered motor vehicle exceeding these requirements shall be exempt for a period of 10 minutes if the emissions are a direct result of a cold engine startup and provided the vehicle is in a stationary position. 4) These standards shall apply to motor vehicles intended, designed, and manufactured primarily for travel or use in transporting persons, property, auxiliary equipment, and/or cargo over roads, streets, and highways. 	Applicable to alternatives that include transportation of soil.

TABLE 2 (CONTINUED)

SUMMARY OF ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

STATE ARARS					
Action	Applicable	Relevant and Appropriate	Citation	Description	Comments
4. Odor emissions.	Yes	--	5 CCR 1001-4, Regulation 2	Colorado odor emission regulations require that no person shall allow emission of odorous air contaminants that result in detectable odors that are measured in excess of the following limits: For residential and commercial areas – odors detected after the odorous air has been diluted with seven more volumes of odor-free air.	Applicable to alternatives that include construction activities in residential areas.
5. Smoke and opacity.	No	Yes	5 CCR 1001-3, Regulation 1, Sect. II.A	Excavation and backfilling of soils must be conducted in a manner that will not allow or cause the emission into the atmosphere of any air pollutant that is in excess of 20% opacity.	Regulation specifically exempts fugitive emissions generated by excavation/backfilling activities. Relevant and appropriate to alternatives that include excavation and backfilling of soils.
6. Ambient Air Standard for Total Suspended Particulate Matter.	Yes	--	5 CCR 1001-14	Air quality standards for particulates (as PM ₁₀) are 50 µg/m ³ ; annual geometric mean, 150 µg/m ³ 24 hour.	Applicable to alternatives that include actions that generate fugitive dust.
7. Ambient Air Standard for Lead.	Yes	--	5CCR 1001-10, Regulation 8	Monthly air concentration must be less than 1.5 µg/m ³ .	Applicable to alternatives that include actions on contaminated soil that generate fugitive dust.

TABLE 2 (CONTINUED)

SUMMARY OF ACTION-SPECIFIC ARARS PERTINENT TO DUST CONTROL ACTIVITIES

FEDERAL ARARs					
Standard, Requirement or Criteria	Applicable	Relevant and Appropriate	Citation	Description	Comments
National Ambient Air Quality Standards	No	Yes	40 CFR Part 50	Establishes ambient air quality standards for certain "criteria pollutants" to protect public health and welfare. Standards are: 150 micrograms per cubic meter for particulate matter for a 24 hour period; <i>50 micrograms per cubic meter for particulate matter- annual arithmetic mean;</i> 1.5 micrograms lead per cubic meter maximum - arithmetic mean averaged over a calendar quarter	National ambient air quality standards (NAAQS) are implemented through the New Source Review Program and State Implementation Plans (SIPs). The federal New Source Review Program addresses only major sources. Emissions associated with the removal action would be limited to fugitive dust emissions associated with earth moving activities during construction. These activities will not constitute a major source. Therefore, attainment and maintenance of NAAQS pursuant to the New Source Review Program are not applicable. However, the standards relating to particulates and to lead are relevant and appropriate.

**TABLE 3
ACTION LEVELS**

CONDITION	ACTION
TSP, 15 minute average	
< 100 $\mu\text{g}/\text{m}^3$	No additional dust control.
> 100 and < 150 $\mu\text{g}/\text{m}^3$	Additional dust mitigation measures.
> 150 $\mu\text{g}/\text{m}^3$	Work stoppage.
Lead, 30 day average	
> 1.5 $\mu\text{g}/\text{m}^3$	Work stoppage until additional dust measures are implemented to ensure compliance with the standard.
Arsenic, 24-hour average	
> 2.8 $\mu\text{g}/\text{m}^3$	Additional dust mitigation measures.

Note: The TSP action levels are initial conservative levels that assume all TSP is PM₁₀. After the initial monitoring period, the TSP action levels will be revised to account for measured fractions of PM₁₀ and PM_{2.5}.

ATTACHMENTS

ATTACHMENT A

**STANDARD OPERATING PROCEDURE
FOR REAL-TIME DUST MONITORING**

STANDARD OPERATING PROCEDURE FOR REAL-TIME DUST MONITORING

1.0 INTRODUCTION

The following section describes procedures to be followed for real-time dust monitoring during remediation of residential areas at the Vasquez Boulevard/Interstate 70 Superfund Site.

The purpose of this protocol is to specify methods to be used when operating the personal DataRAM (referred to as a MiniRAM) manufactured by MIE, Incorporated, or equivalent. The MiniRAM will be used to measure total suspended particulate (TSP) at boundaries of residential properties during remediation. These data will be used to measure any generation of dust from soil remediation work and to determine the immediate effectiveness of fugitive dust control measures.

2.0 SAMPLE COLLECTION

Placing the samplers:

- The units will be placed on a tripod and elevated to approximately 2 meters during operation.
- A MiniRAM sampler will be placed within or on the boundary of the work area.
- The operator will use the prevailing wind direction data from the meteorological station, local weather forecasts, neighborhood wind sock and site experience to select the downwind sampling locations.
- The MiniRAM will be periodically relocated so as to remain generally downwind of dust generating activities.
- A MiniRAM will also be operated to measure background TSP levels at the site. The sampler will be sited in a location that will not be affected by remedial activities.

Frequency of sampling:

- The MiniRAM sampler will be operated every workday at each residential property when removal of contaminated soil is being performed.

Preparing the MiniRAM:

- Remove the MiniRAM from a ziplock plastic bag.
- At the beginning of each workday inside an enclosed building, place the MiniRAM inside the MIE Zeroing Kit.
- Zero the MiniRAM according to the manufacturer's instructions.

- Note the date, general location, name of representative, and general activities in the MiniRAM Monitoring Form.
- Verify that the MiniRAM is programmed to store 1-hour average concentrations.
- Verify that the MiniRAM is programmed to trigger an alarm when a 15-minute average TSP concentration reaches $100 \mu\text{g}/\text{m}^3$. This action level will be modified based on site-specific data generated during the initial monitoring period.
- Attach the unit onto a tripod.
- Place the MiniRAM downwind of dust generating activities and note the time, location, and wind direction on the MiniRAM Monitoring Form.
- Four times a day (typically mid-morning, noon, mid-afternoon, and end of day), interrogate the MiniRAM and note the time checked, location, wind direction and previous hourly averages on the MiniRAM Monitoring Form.
- At the conclusion, detach MiniRAM from tripod and place it inside a ziplock plastic bag.
- Store in a secure location.

Maintenance and Calibration:

- At the beginning of the program, a gravimetric field calibration will be performed by placing the MiniRAM next to the MINIVOL and operating both instruments for one day. The TSP concentration results from the two instruments will be compared. If a significant difference exists (see Dust Control Plan), the MiniRAM's calibration constant will be changed accordingly. The field calibration will be performed in a manner consistent with the User's Manual.
- Recharge the nickel-metal-hydride batteries every 72 hours of use.
- An aerosol dust cleaner will periodically be used to blow air across the sensor chamber to free up any lodged wind-blown material.

3.0 ACTION LEVELS AND IMPLEMENTATION OF DUST CONTROL MEASURES

Action levels for more aggressive dust control measures and possible cessation of activities will be based mainly on the real-time TSP monitoring results, as shown in Table 1. Additional alterations to the dust mitigation activities will be based on the action levels for lead listed in the SOP for PORTABLE DUST MONITORING.

TABLE 1 PROTECTION PROGRAM SUMMARY	
CONDITION	ACTION
TSP, 15-minute average ^(a)	
< 100 $\mu\text{g}/\text{m}^3$	no additional dust mitigation
>100 and < 150 $\mu\text{g}/\text{m}^3$	additional dust mitigation
> 150 $\mu\text{g}/\text{m}^3$	work stoppage

^(a) The MiniRAM has an audible alarm that will be set to go off at a 15-minute average of 100 $\mu\text{g}/\text{m}^3$. The MiniRAM alarm can only be set to real-time (instantaneous) or 15-minute averages. These are initial action levels that will be modified based on site-specific data from the initial monitoring period.

If the alarm sounds on the MiniRAM, a 15-minute average concentration has exceeded 100 $\mu\text{g}/\text{m}^3$, extra dust mitigation measures are required (see below) and the following additional monitoring procedures will apply:

- After additional controls are implemented, take a downwind 15-minute time-weighted average concentration.
- If this successive TSP measurement is below 100 $\mu\text{g}/\text{m}^3$, the added mitigation measures will cease.
- If mitigation measures are unsuccessful resulting in higher concentrations in excess of 150 $\mu\text{g}/\text{m}^3$, the remediation manager will order work to stop.
- Work is allowed to resume only if a downwind 15-minute average concentration is below the 100 $\mu\text{g}/\text{m}^3$ threshold.

As described in the Dust Control Plan, dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Additional dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

4.0 DOCUMENTATION

Activities relating to real-time TSP monitoring will be recorded on an MiniRAM Monitoring Form for each day of active soil remediation. Information recorded on the MiniRAM Monitoring Form will include the following for the MiniRAM:

- general location;
- remediation manager;
- general activities; and
- an initial of the person who zeroed the MiniRam.

Under the General Notes,

- identify the time the MiniRAM was checked;
- the location of the sampler (i.e., SW side of excavation area); and
- the direction from which the wind was blowing.

Under the Dust Concentration Notes,

- identify the ending hour of time weighted average concentration and;
- the TSP concentration in micrograms per cubic meters ($\mu\text{g}/\text{m}^3$).

All daily MiniRAM Monitoring Forms will be maintained on-site and made available to EPA's on-site, oversight representative at his/her request. Copies of the daily logs, and all data print-outs from the monitors will be maintained on file at the Supervising Contractor's office.

MiniRAM Monitoring Form

Date: _____

General Location: _____

Asarco Representative: _____

General Activities: _____

Person Who Zeroed the MiniRAM (initial)? _____

[illegible]

ATTACHMENT B

**STANDARD OPERATION PROCEDURE
FOR PORTABLE DUST MONITORING**

STANDARD OPERATING PROCEDURE FOR PORTABLE DUST MONITORING

1.0 INTRODUCTION

The following describes procedures to be followed for ambient portable dust monitoring during remediation of residential properties in the Vasquez Boulevard/Interstate 70 Superfund Site.

The purpose of this protocol is to specify methods to be used when collecting filter samples of the ambient total suspended particulates (TSP) with Airmetrics MINIVOL samplers, or equivalent. In addition to TSP, the filters will also be analyzed for arsenic and lead. These data will be used to document compliance with standards, where applicable, help identify the source and nature of the dust, and assess potential offsite, airborne transport of arsenic and lead.

2.0 SAMPLE COLLECTION

Placing the samplers:

- The units will be placed on tripod/mast assemblies and elevated to approximately 2 meters above the ground surface during operation.
- The intake should be positioned at least 30 cm from an obstacle to air flow.
- The tripods will be secured to the ground using stakes.
- The MINIVOL sampler will be located at a fixed location based on the active work area in relation to the wind patterns and background sources.
- The remediation manager will use the prevailing wind direction data from the meteorological station, neighborhood wind sock, local weather forecasts and site experience to select the sampling locations.

Frequency of sampling:

- A MINIVOL portable sampler will be placed in a location anticipated to be downwind of the dust-generating remedial or redevelopment activities.
- The MINIVOL sampler will be operated every work day, when soil removal/replacement activities are being performed.
- Twenty-four hour samples will be collected commencing the night before onsite activities and continuing until the next night (midnight to midnight).
- Once every month, two MINIVOLs will be placed within two meters of each other for one sample day for quality assurance purposes.
- During days when the second MINIVOL is not being used to collect quality assurance samples, random samples will be collected at the discretion of the MINIVOL operator. This

will depend on the initial (periodic) monitoring results and on observations made during site activities. (Expected applications might include background sampling or measurements to augment the coverage of the primary MINIVOL during intensive remedial activities.)

Preparing the MINIVOL:

- The MINIVOL samplers will be calibrated, operated, and maintained in accordance with the manufacturer's specifications.
- Upon purchasing the 47-mm Teflon filters, the filters will be sent to the laboratory for initial tare weighing.
- After the laboratory sends the pre-weighed filters to the Site, each filter will be put into its own individual petri slide. Each unused filter arrives with two numbered labels attached. One label is attached to the filter holder inside the sampler, while the other is attached to the petri slide.
- Remove the sampler from the hanging bracket.
- Inside a building, remove the timer and pump assembly by grasping the 6" lid, taking care not to disconnect the power cord from the battery. Do not grasp the center of the circuit board. Mount the assembly on the edge of the sampler casing using the pump mount stand. Leave battery attached.
- Record the hours shown on the elapsed time totalizer in the MINIVOL Monitoring Log.
- Press the Timer On/Auto/Off button to start pump.
- If a RED LIGHT is illuminated (indicating either low flow or low battery), press the Reset button to start pump.
- With the sampler held vertically, read the flowmeter (to the nearest tenth at center of ball) and record the ending flow rate.
- Lower assembly back into tube.
- Before removing the preseparator/filter holder assembly from sampler, cross-check the filter sticker number on the assembly against the filter number for that site on the worksheet. These numbers should match. If not, make a note of this, recording the actual filter number.
- Remove the preseparator/filter holder assembly at the quick-connect and place it in clean plastic bag for transport back to the building.
- Attach a new preseparator/filter holder assembly containing a new filter at the sampler quick-connect.
- Change the battery pack. (Do not inadvertently confuse and reuse the spent battery.) If either the "low" or "low voltage" indicator was illuminated, make a note that the spent battery may be defective.
- Check the sampler for leaks. Remove the pump and timer assembly from the sampler body, start the pump by pressing the On/Auto/Off button, and cover the inlet with palm. The ball should drop to the bottom of the flowmeter. If it does not, check/tighten all tubing, joints, and quick-connect fittings until the sampler is leak-free.
- If the low flow indicator was illuminated, check for crimps or air restrictions in the inlet or tubing.

- In the MINIVOL Monitoring Log, record location, sampler #, battery #, new filter #, operator, and any comments.
- With the sampler running and while holding it vertically, adjust the flow rate to the correct level. Record the beginning flow rate to the nearest tenth of liter/minute in the MINIVOL Monitoring Log.
- Turn the pump off by pressing the ON/AUTO/OFF button.
- Record the hours shown on the elapsed time totalizer in the MINIVOL Monitoring Log.
- Set the programmable timer for a 24-hour period beginning at midnight and ending at midnight the following day.
- Lower the pump and timer assembly into the sampler body and reinsert the bale assembly bar.
- Return the sampler to the mounting cradle, raising it as vertically as possible.

Handling the TSP filter:

- In a sheltered location (to prevent potential sample loss from wind or other activity) unscrew the filter holder ring from the top of the exposed filter holder assembly.
- Locate the petri slide with the filter number which matches the number on the side of the filter holder assembly. This is the original petri slide that the filter came on.
- Unscrew the preseparator adapter from the filter holder assembly. Lift off the anti-twist ring from the base.
- Using tweezers, carefully remove the exposed filter from the drain disk and place it into its original petri slide, replacing the petri slide lid when finished. (Be sure to replace the drain disk back on the filter support grid in the filter holder assembly.)
- Remove the old ID tag from the filter holder assembly base and discard. (Recheck this number to be sure it matches the number on the petri slide.)

Analytical Procedures:

- The laboratory will perform a gravimetric analysis of the MINIVOL filters for mass concentration.
- The laboratory will analyze filters for lead and arsenic using EPA SW-846 Method 6020.
- The average concentration of the constituents over the monitoring period will be calculated by dividing the mass values for TSP, lead and arsenic by the volume of air sampled.
- The reported concentration will be corrected to EPA standard conditions (25°C and 760 mm Hg).

Maintenance and Calibration:

- Before the start of the Project, and then at the beginning and end of each construction season or at 6-month intervals thereafter, each MINIVOL will have a six-point calibration to calculate

the flow rate to local ambient conditions. The six-point calibration/audit will be performed in a manner consistent with the User's Manual.

- The flowmeter should be cleaned or replaced if it indicates no flow, low flow, excessive flow, or erratic flow. The flowmeter should be cleaned per the instruction listed in the Operations Manual.
- If the flow rate becomes irregular or it does not allow the flow rate to be adjusted accurately, the pump valves and diaphragms may need to be cleaned or replaced.
- A single-point calibration will be performed once every month and at the first sign of the following warning lights: *low-flow threshold indicator* and *low-flow cutoff indicator*. The single-point calibration will be performed in a manner consistent with the User's Manual. The flow should be within ± 15 percent of 5 liters per minute at current conditions. If the unit fails to operate in this range the sampler must be repaired or recalibrated.
- The rain hat and preseparator/filter holder assembly should be cleaned every 2 to 4 sampling periods, or more frequently if soiling is observed.
- Tubing and fittings must be routinely checked for crimps, cracks, or obstructions. Fittings should be inspected periodically for cross-threading and tightness.
- Since a single AA alkaline battery powers the programmable timer, the battery should be checked periodically and replaced as necessary to prevent failure during operation.
- The 30-hour battery pack used to power the pump, should be emptied after each sampling day before charging.

2.1 Sample Labeling, Handling and Chain of Custody

A Chain-of-Custody Record (COC) will be completed for each sample lot, secured in an plastic bag, and placed into each shipping container for shipment to the laboratory with the samples. Information contained on the triplicate, carbonless COC form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;
- Method of shipment;
- Carrier/waybill number (if any);

- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is transferred;
- Date and time of sample custody transfer; and
- Conditions of samples upon receipt by laboratory.

When custody changes, personnel handling the sample exchange shall sign the record along with the date, time, and company affiliation. A copy of the record will be retained by the field sampler. Signed and completed copies of the records shall be returned by the laboratory with the analytical report.

3.0 ACTION LEVELS AND IMPLEMENTATION OF DUST CONTROL MEASURES

Action levels for more aggressive dust-control measures and possible cessation of activities will be based mainly on the real-time TSP monitoring (see Dust Control Plan and SOP for REAL-TIME DUST MONITORING). Additional alterations to the dust mitigation activities will be based on the action levels for lead (refer to Dust Control Plan). No action levels will be in effect for arsenic.

Dust control measures will be implemented aggressively under arid or windy conditions, whenever dust plumes are observed leaving the Site, or as indicated by the action levels. As described in the Dust Control Plan, dust control measures will include application of water sprays to restrict dust generation in vehicle traffic routes and work areas. Additional dust control measures that may be used are: increased frequency of water spray applications, regulation of vehicle speed, placement of additional clean gravel as a ground cover in high dust generation areas, application of surfactant, or other appropriate measures. Care will be taken to avoid application of excessive amounts of water that may cause unacceptable working conditions or increase the possibility of surface run-off. If additional dust control measures do not eliminate visible dust, removal activities will be temporarily suspended until additional dust control measures have been implemented, or until adverse weather conditions abate.

4.0 DOCUMENTATION

Activities relating to portable dust sampling will be recorded on an MINIVOL Monitoring Log for each day of active soil remediation. Information recorded on the MINIVOL Monitoring Log will include the following for the MINIVOLs:

- the hours shown on the elapsed time totalizer after the sampling event;

- the ending flow rate after the sampling event;
- the location #, sampler #, battery #, new filter #, operator, and any comments at the start of a new sampling event;
- the beginning flow rate to the nearest tenth of liter/minute (should be adjusted to 5 liter/minute, if needed)
- the hours shown on the elapsed time totalizer after the initial flow rate check;
- periodic checks of the rotameter throughout the sampling day; and
- any maintenance procedures.

All daily MINIVOL Monitoring Logs will be maintained on-site and made available to EPA's on-site, oversight representative at his/her request. Copies of the daily logs, and all data print-outs from the monitors will be maintained on file at the Supervising Contractor's office.

MINIVOL MONITORING LOG

Date: _____ Location: _____ Sampler ID: _____ Filter No. _____ Battery No. _____ Operator: _____				Date: _____ Location: _____ Sampler ID: _____ Filter No. _____ Battery No. _____ Operator: _____			
Parameters	Start	End	Units	Parameters	Start	End	Units
Atm Pressure			(mmHg)	Atm Pressure			(mmHg)
AmbTemp			(°C)	AmbTemp			(°C)
Clock Time				Clock Time			
Elap Time			(hours)	Elap Time			(hours)
RotoFlow			(lpm)	RotoFlow			(lpm)
Comments:				Comments:			

Date: _____ Location: _____ Sampler ID: _____ Filter No. _____ Battery No. _____ Operator: _____				Date: _____ Location: _____ Sampler ID: _____ Filter No. _____ Battery No. _____ Operator: _____			
Parameters	Start	End	Units	Parameters	Start	End	Units
Atm Pressure			(mmHg)	Atm Pressure			(mmHg)
AmbTemp			(°C)	AmbTemp			(°C)
Clock Time				Clock Time			
Elap Time			(hours)	Elap Time			(hours)
RotoFlow			(lpm)	RotoFlow			(lpm)
Comments:				Comments:			

FIELD AUDIT WORKSHEET FOR AN AIRMETRICS MINIVOL SAMPLERS
(Using Bubble or Dry Flow Calibrators)

Project _____	_____	Make _____	Model _____	S/N _____
Audit Site _____	_____	Airmetrics _____	MINIVOL _____	_____
Baro. Pressure (P_a) _____ mmHG	_____	Barometer _____	_____	_____
Temp. (T_a) _____ (°C) _____ (°K)	_____	Thermometer _____	_____	_____
⁽¹⁾ Vapor Pressure (P_v) _____ mm Hg	_____	Cal. Device _____	_____	_____
Site Elevation _____	_____	& Chamber _____	_____	_____
Date/Time _____	_____			
Auditor _____	_____			

	Sampler Flow Indication (Rotameter Setting) [X]					
	(LPM)					
	4.0	4.5	5.0	5.5	6.0	6.5
Flow Meter Readings (Actual LPM)						
Average Flow Rate (Q_u) ⁽²⁾ (uncorrected) (LPM)						
Average Corrected Flow Rate (Q_c) (LPM) [Y]						
Percent Diff. of Indicated from Audit						

⁽¹⁾ P_v : Vapor pressure of water. Use only for soap bubble meters.

⁽²⁾ For Conditions with relative humidity less than 50%, flows measured by a soap bubble meter must be corrected by the following formula: $Q_c = Q_u (P_a - P_v)$

Sampler Calibration Relationship:

m (slope) = _____ b (y-intercept) = _____
 r (corr. Coef.) = _____

Percent Difference = $\frac{(\text{Indicated} - \text{Calibration})}{\text{Calibration}} \times 100$

Signature: _____ Date: _____

APPENDIX F

CONSTRUCTION QUALITY ASSURANCE PLAN

**CONSTRUCTION QUALITY ASSURANCE PLAN
FOR NON-TIME-CRITICAL REMOVAL ACTION
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE
DENVER, COLORADO**

March 2003

Prepared for:

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<u>Attachment</u>	<u>Title</u>
A	Standard Operating Procedures

1.0 INTRODUCTION

This Construction Quality Assurance Plan (CQAP) presents requirements for quality assurance (QA) inspection and testing of removal action construction at the Off -Facility Soils Operable Unit of the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site located in the north-central section of Denver, Colorado.

The United States Environmental Protection Agency (USEPA) is the lead agency responsible for the non-time-critical removal action at the VB/I70 site. USEPA will identify an independent third party, possibly the U.S. Army Corps of Engineers or an engineering contractor, to serve as the Supervising Contractor for removal action construction. This CQAP specifies procedures to provide for compliance with the removal action to be performed by the Supervising Contractor's Field Project Supervisor and Environmental Quality Assurance Official. It also provides a brief summary of Quality Control (QC) procedures to be utilized by the construction contractor(s) to achieve compliance with the plans and specifications. This CQAP is supported by and included as an appendix to the Removal Action Work Plan.

2.0 PROJECT ORGANIZATION AND SUPPORTING INFORMATION

This section provides an overview of the relationships between the project participants and their respective roles and responsibilities during preparation for and implementation of the removal action construction at the site. A list of the key participants follows:

USEPA: Overall responsibility for remedial and removal actions at the VB/I70 site.

Supervising Contractor: Represents USEPA during construction and has overall responsibility for management and documentation of removal actions, to provide for compliance with project requirements and achievement of project objectives.

Construction Contractor: Independent, qualified contractor retained by USEPA or the Supervising Contractor to carry out the removal actions in accordance with approved designs and work plans.

USEPA's Work Assignment Manager (WAM) is to be determined. The Project Manager (PM) for the Supervising Contractor will be identified prior to construction. The PM for the Supervising Contractor will report directly to the USEPA WAM. A full-time onsite Field Project Supervisor (FPS) for the Supervising Contractor will be determined prior to construction. The FPS will have authority as USEPA's representative onsite, and will report directly to the Supervising Contractor's PM. The FPS will be responsible for day-to-day inspection and management of removal action activities to provide for compliance with the project plans and specifications and will document all inspections and work progress for compliance and for construction contract administration purposes. The FPS will also coordinate all quality assurance (QA) activities performed by third parties to provide for compliance with the project plans and specifications.

All contractor technical submittals and project design changes will be routed through the PM for review and approval, and all design or scope changes will be subject to review and approval by the PM and WAM. All major project change orders will be subject to review by the PM based on recommendations from the WAM.

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An Environmental Quality Assurance Official (EQAO) will be identified by the Supervising Contractor prior to construction. The EQAO will be responsible for ensuring that the testing procedures are performed in accordance with this CQAP and will consult with the FPS to confirm that the field procedures are performed in accordance with the design. The EQAO's duties will include reviewing documentation of field sampling procedures, verifying that the laboratory is adhering to project specifications, and working with the laboratory to identify the need for corrective measures and their completion.

3.0 REMOVAL ACTION CONSTRUCTION

This section describes the procedures and testing frequencies to be used in achieving project quality assurance/quality control (QA/QC) as specified in the Construction Technical Specifications (Appendix G of the Removal Action Work Plan). In this CQA Plan, quality control (QC) refers to the procedures, methods and tests utilized by the Construction Contractor to achieve compliance with the plans and specifications, and quality assurance (QA) refers to the site inspection, checks and tests performed by the Supervising Contractor to ensure that the substantive requirements and intent of the plans and specifications are met. Quality Control requirements are described herein, because QA activities include inspection of the QC tests and performance of QA tests at a lesser frequency.

3.1 Quality Control (Construction Contractor's Responsibility)

This section describes the Construction Contractor's responsibilities for QC during preparation for and implementation of the removal actions. The Construction Contractor shall be responsible for all QC requirements specified in this section and the Construction Technical Specifications, including functions delegated to subcontractors.

3.1.1 Pre-Removal Action Construction Characterization

The Construction Contractor will not participate in the pre-removal action characterization activities and will not be responsible for any QC functions during this phase of the project. All pre-removal action construction activities will be performed by the Supervising Contractor as described in Section 3.2.1.

3.1.2 Removal Action Construction

The primary QC procedures to be utilized by the Construction Contractor during removal action construction include the use of adequately skilled personnel for the work being performed and compliance with the Construction Contract Documents. In addition, the contractor will be required to perform periodic level and survey controls and material testing to achieve compliance with the plans and specifications. These QC requirements are summarized on Table 3-1 and discussed below.

Pre-and post-excavation construction (elevation) surveys will be required to demonstrate that the minimum excavation depth of 12-inches has been achieved. The Construction Contractor will establish elevation control points within and around the perimeter of each area to be excavated at a minimum frequency of one control point per 500 square feet or a minimum of three points per excavation. Pre- and post-excavation elevations at each control point will be determined to within +/- 0.1 feet and the calculated net difference will be used to demonstrate compliance with the minimum excavation depth.

The Construction Contractor will continuously monitor the active excavation and contaminated material handling areas for visible dust. Additional dust control measures will be implemented if visible dust emissions are observed or as otherwise required by the Supervising Contractor.

Physical and chemical testing of the replacement materials will be required for construction QC. Representative samples of the proposed replacement materials will be tested prior to initial source approval. As shown on Table 3 -1, physical tests for the replacement materials will include texture/grain-size by the American Society for Testing and Materials (ASTM) method D422, to demonstrate that the materials meet the minimum material specifications. Chemical tests for the replacement soils will include analyses for metal, pesticide, polychlorinated biphenyl (PCB), semi-volatile and volatile constituents by USEPA-approved methods (see Table 3-1) to demonstrate that the materials meet the replacement material chemical criteria (Table 2-1 in the Removal Action Work Plan). Chemical tests for the replacement gravel will include analyses for arsenic and lead by USEPA-approved methods.

Following initial material and source approval, on-going quality control testing of the replacement materials will be performed. Samples of each material will be collected at a rate of one sample per 1,000 cubic yards (cy) for arsenic and lead analyses to confirm that the concentration of these constituents meet the replacement material criteria. These values are listed on Table 2-1 of the Removal Action Work Plan. Samples for on-going testing of the physical parameters will be collected and analyzed at a rate of one sample per 5,000 cy to demonstrate continued compliance with the material specifications. In addition, the Supervising Contractor may request supplemental quality control samples for physical and chemical testing if changes are observed in the material consistency.

Quality control measures for replacement vegetation will include review and submittal of supplier certificates, material safety data sheets (MSDSs), and manufacturer -provided information regarding

material use. These information sources will be reviewed for initial approval of the materials and on-going construction QC.

3.2 Quality Assurance (Supervising Contractor's Responsibility)

The primary QA procedures to be performed by the Supervising Contractor will include full-time inspection of the construction by the FPS with periodic inspections by the PM. All procedures, materials, and equipment used in the construction will be observed and monitored by the FPS on a daily basis. All QC data supplied by the Construction Contractor will be reviewed for testing adequacy and compliance with the plans and specifications. QC data or installed elements that are not in compliance with the plans and specifications will be reworked or replaced by the Construction Contractor so that the element is in compliance. All QC data and information supplied by the Construction Contractor will be documented by the FPS to allow complete project tracking of all components of the construction. Site project meetings will be held as necessary with the Construction Contractor, the FPS and oversight personnel to discuss work progress, QA/QC issues and upcoming work to maintain the overall project quality.

3.2.1 Pre-Removal Action Construction Characterization

In preparation for removal action construction, soil samples will be collected to further characterize select gardens and flowerbeds, to identify the composition of existing yard soils, and to characterize the residential yard soils for disposal purposes. Details of the pre-removal action sampling activities are summarized on Table 3-1 and discussed below.

Soil samples will be collected from gardens and flowerbeds identified by the property owners during the initial visit to scope the property remediation activities. Gardens and flowerbeds for which property owners express a strong desire to preserve will be sampled to determine if the soil lead or arsenic concentrations exceed the Site remedial action levels. Based on the sampling results, flowerbeds and gardens with soil arsenic and/or lead concentrations at or above the remediation action levels of 70 ppm and 400 ppm, respectively, will be remediated while those with soil concentrations below the action level will be preserved. The flowerbed and garden characterization samples will be collected and analyzed by the Supervising Contractor in accordance with the procedures specified in Section 4.0.

Soil samples will be collected and analyzed to characterize the existing yard soils and support an evaluation of the composition requirements (i.e., percent clay, silt, and sand) for the replacement soil. A representative subset of yards scheduled for remediation will be sampled to assess the composition of the existing yard soils. Results of these analyses will be used to identify acceptable composition limits for the replacement soil. The yard composition samples will be collected and analyzed by the Supervising Contractor as described in Section 4.0.

Samples of the soil to be removed will be collected and analyzed to assist in identifying suitable disposal alternatives for the materials. Representative in-place composite samples will be collected from yards scheduled for remediation according to the procedures specified in Section 4.0. The samples will be analyzed for leachable metal, pesticide, herbicide, semi-volatile, and volatile constituents in order to support classification of the material as solid waste. Results of the analyses will be used to identify a suitable disposal site(s) for the materials.

3.2.2 Removal Action Construction

As discussed in Section 3.1.1, measurement of the depth of the required excavation areas will be evaluated through construction elevation surveys to be performed as part of the Construction Contractor's QC testing. The Supervising Contractor will review the raw data and calculations generated by the surveys and will visually observe the excavations for compliance with the extent and depth requirements. The general observations will be supplemented by random spot checks of the excavation sidewall depths by yardstick, tape measure or level. Interior grade stakes may be specified at the discretion of the FPS. Where interior grade stakes are used, the areas around the stake will be excavated to the required depth while preserving the original grade at the stake. The elevation difference between the original and final grades will then be measured by yardstick, tape or level to confirm that the required excavation depth has been achieved. Once the excavation depth has been confirmed, the soil around the grade stake will be excavated flush with the finished grade of the excavation. The Supervising Contractor will record the results of all quality assurance measurements.

The Supervising Contractor will monitor the active work areas for fugitive dust emissions. Monitoring will include use of field instruments and collection and analysis of laboratory samples. Details of the dust monitoring program are specified in Section 4.0 and the Fugitive Emissions Dust Control Plan (Appendix E of the Design Work Plan).

The physical and/or chemical properties of the replacement soils and gravel materials will be identified through quality control testing by the Construction Contractor, as described in Section 3.1.1. The Supervising Contractor will review the laboratory testing reports provided by the Construction Contractor to confirm that the materials meet the replacement materials chemical criteria (Table 2 -1 of the Removal Action Work Plan) prior to approving the material sources. If the testing results indicate that the materials do not meet project requirements, the Construction Contractor will provide testing results for alternative sources until suitable materials are identified.

Once acceptable material sources have been identified, the Supervising Contractor will routinely monitor the replacement materials as they are brought to work area for changes in consistency. If changes in the material consistency are observed, the Supervising Contractor will direct the Construction Contractor to collect additional samples to confirm the material's physical and chemical characteristics.

As indicated in Section 3.1.1, the Construction Contractor will sample and analyze the replacement materials (soil and gravel) for arsenic and lead at 1,000 cy intervals. The Supervising Contractor will review these results to confirm on-going acceptability and collect its own quality assurance samples for arsenic and lead analyses with every fifth QC sample. In conjunction with the QA samples for arsenic and lead, the Supervising Contractor will also collect samples of the soils for additional metal, pesticide, PCB, semi-volatile and volatile criteria constituent analyses to provide continuing confirmation that the replacement materials meet the replacement material chemical criteria (Table 2-1 of the Removal Action Work Plan). Further details of the sampling and analysis procedures for the QA samples are discussed in Section 4.0.

Quality assurance for the replacement vegetation will include reviewing the labels, certificates, MSDSs and manufacturer's recommendations submitted by the Construction Contractor to verify that the materials meet the specifications. The Supervising Contractor will also visually observe and confirm that the vegetation materials and procedures meet the project requirements and are conducted in accordance with the manufacturer's recommendations, where applicable. In addition, the restored properties will be inspected by the Supervising Contractor on, or shortly before, the final day of the post-remediation maintenance/watering period, to confirm that all replacement vegetation is in good condition.

4.0 ENVIRONMENTAL SAMPLING AND ANALYSIS

This section describes the environmental sampling and analysis procedures, including quality assurance requirements to support implementation of the removal actions. Environmental sampling tasks to be performed in support of removal action construction actions will include:

- Sampling and analysis of soil from select gardens and flowerbeds to identify areas that warrant removal and replacement;
- Sampling and analysis of soil from select residential yards to support evaluation of the replacement soil composition requirements;
- Sampling and analysis of materials to be removed from the residential yards to support classification of the materials for disposal;
- Sampling and analysis of the replacement materials to confirm that they meet the Site clean soil criteria and verify the Construction Contractor's quality control sample results; and
- Sampling and analysis of ambient dust collected as part of the air monitoring program to assess air quality.

This plan briefly describes sampling and analysis of dust to assess fugitive emissions. Details are provided in the Fugitive Emissions Dust Control Plan (Appendix E to the Removal Action Work Plan). Analyses of samples for health and safety purposes will be addressed in the Construction Health and Safety Plan. The Construction Health and Safety Plan will be prepared by the Construction Contractor (see Technical Specifications; Appendix G of the Removal Action Work Plan).

4.1 Project Responsibilities

Key positions of the environmental quality assurance team are the EQAO, the Project Chemist and the Laboratory Quality Assurance Officer (LQAO). The individuals who will fill the environmental quality assurance team roles will be designated by the WAM or the Supervising Contractor's PM prior to initiating the pre-remediation sampling or removal action construction.

The EQAO will be responsible for ensuring that the analytical procedures are performed in accordance with this CQAP and will consult with the FPS to confirm that the field procedures are performed in accordance with the plan. The EQAO's duties will include reviewing documentation of field sampling procedures, verifying that the laboratory is adhering to project specifications and working with the laboratory if corrective measures are necessary and require resolution. The EQAO may assist the

Project Chemist in performing data evaluation or validation, if necessary. The EQAO will discuss any systematic errors or other anomalous data with the Supervising Contractor's PM and FPS. If corrective actions are necessary, the EQAO will be responsible for confirming that they are initiated and completed.

The Project Chemist will be responsible for coordinating with the laboratory regarding analytical requirements and scheduling. Upon receipt of the analytical data, the Project Chemist will perform the necessary data evaluation or validation (refer to Section 4.7); the EQAO may assist the Project Chemist in this function, if necessary. The Project Chemist will also provide support to the FPS and the EQAO regarding issues concerning sample collection, handling and storage.

The LQAO is responsible for all aspects of the sample analyses. The LQAO will be responsible for ensuring that sample holding times and custody requirements are met, overseeing the analyses, confirming that the laboratory QA requirements are met, and reviewing the data packages prior to distribution. The LQAO will coordinate with the Project Chemist regarding any issues related to the sample analyses.

4.2 Sampling Objectives and Procedures

This section describes the sampling objectives and procedures for the four types of environmental sampling to be performed to support the removal action.

4.2.1 Garden and Flowerbed Sampling

At the request of an individual property owner, pre-remediation sampling and analysis of select gardens and flowerbeds will be conducted to determine if the flowerbed and garden soils contain arsenic and/or lead in concentrations that exceed the Site remedial action levels. Sampling will generally be conducted in gardens and flowerbeds that the property owners wish to exclude from the overall yard remediation program. Analytical results for the samples will be used by the PM to determine if the flowerbeds and gardens can be excluded or if they must be removed and replaced during property remediation.

Samples will be collected from the gardens and flowerbeds on a property-by-property basis. One composite sample will be collected from each garden and/or flowerbed identified for sampling. The

garden or flowerbed will be divided into two approximately equal -area units and a soil core from the 0-2 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil will then be thoroughly blended and the sample will be collected from the composited material.

The samples will be analyzed using inductively coupled plasma (ICP) atomic emission spectrometry (USEPA SW-846 Method 6010). An analytical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the garden and flowerbed soil samples are provided in Section 4.4.

4.2.2 Yard Soil Composition Sampling

Soil samples will be collected from a subset of the residential yards scheduled for remediation to characterize the existing yard soils and support an evaluation of the composition requirements (i.e., percent clay, silt and sand) for replacement soil.

One soil sample will be collected from ten residential properties to be remediated. To provide for the results to be representative of the site, samples will be collected as follows: 3 from the Cole neighborhood; 3 from the Clayton neighborhood; 1 from the Elyria neighborhood; and 3 from the Swansea neighborhood (at least one from north and south of I-70). Within each neighborhood, the Supervising Contractor will select properties that are spatially distant from each other to provide data across the site. At each selected property, soil will be uniformly retrieved over the 0 -12 inch depth interval at a single location near the center of the yard.

Each sample will be analyzed for clay, silt and sand content according to ASTM method D-422, or other suitable method. A geotechnical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the soil samples are provided in Section 4.4.

4.2.3 Disposal Characteristics Sampling

Samples of materials to be removed from the residential yards will be collected and analyzed to support classification of the materials for disposal. The purpose of the sampling is to measure the

concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents in sample leachate to determine if the materials may be managed as solid waste.

One composite sample will be collected for every twenty residential properties. The composite sample will be prepared by randomly selecting four of the properties for sampling. At each property, the planned excavation area will be divided into four approximately equal area sampling units. Soil cores from the 0 -12 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil from all four properties will then be thoroughly blended and the sample will be collected from the blended material.

Each sample will be extracted using the appropriate Toxicity Characteristic Leaching Procedure (TCLP) extraction procedure (USEPA SW-846 Method 1311) and analyzed for metals (Method 6010B/7470), pesticides (Method 8081A), herbicides (Method 8150), semi-volatiles (Method 8270) and volatiles (Method 8260). An analytical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the disposal characteristics soil samples are provided in Section 4.4.

4.2.4 Sampling of Replacement Materials

Samples of each type of replacement material (soil and gravel) used in property restoration will be collected and analyzed to confirm that the materials meet the replacement material chemical criteria (Table 2-1 in the Removal Action Work Plan). The sample results will also be used to verify the Construction Contractor's quality control sample data for arsenic and lead concentrations in the replacement materials.

Samples will be collected from each type of replacement material at a rate of one sample per 5,000 cubic yards of material used. Each sample will be collected as a single grab sample collected from the transport truck carrying the material, a material stockpile or directly following placement during restoration.

The soil samples will be analyzed for the replacement material chemical criteria metals (Method 6010B/7470), pesticides (Method 8081A), semi-volatiles (Method 8270), volatiles (Method 8260), and PCBs (Method 8082). The laboratory will only report the concentrations of the specified replacement

material chemical criteria constituents. The gravel samples will be analyzed for arsenic and lead (Method 6010B). An analytical laboratory identified by the Supervising Contractor and approved by the WAM will analyze the samples. Specific procedures regarding collection, preparation and analysis of the replacement soil samples are provided in Section 4.4.

4.2.5 Sampling of Ambient Dust

The effectiveness of dust control measures in meeting air quality standards will be evaluated using real-time monitoring equipment and laboratory analysis of dust samples. The real-time monitoring equipment will be used to determine the immediate effectiveness of fugitive dust control measures. Exceedances of the established action levels for PM_{10} , $PM_{2.5}$, lead or arsenic, will trigger the implementation of additional dust control measures or temporary suspension of activities. At the same time, filter samples of the ambient dust will also be collected and analyzed for lead and arsenic. These data will be used to document compliance with the air quality standards; help identify the source and nature of the dust; and assess the potential for offsite, airborne transport of arsenic and lead.

Sampling objectives for dust monitoring are described in detail in the Fugitive Emissions Dust Control Plan (Appendix E to the Removal Action Work Plan).

4.3 Quality Assurance Objectives

The project QA objectives are directly tied to the data needs and data uses described in Section 4.2. Prior to and during construction, environmental samples will be collected for the following: (1) identify if select flowerbeds and gardens warrant removal and replacement; (2) support an evaluation of the replacement soil composition requirements; (3) support classification of the materials to be removed for disposal purposes; (4) confirm that the replacement materials meet the project quality requirements and verify the replacement material quality control sample results, and (5) assess ambient dust for comparison to action levels. The QA objectives for these types of data, including acceptable levels of precision, accuracy, representativeness and comparability, are described below. Data that meet their stated QA objectives will be of appropriate quality for use in managing construction-related activities at the site.

4.3.1 Garden and Flowerbed Sampling

Soil samples will be collected from select gardens and flowerbeds to determine if they contain soil with arsenic or lead concentrations at or above the remedial action level, and therefore, warrant removal and replacement during the removal action. A sampling plan has been designed to provide representative samples from each flowerbed and garden sampling unit, as described in Section 4.2.1. The sampling plan provides a sufficient number of samples from which to describe mean arsenic concentration in the flowerbed and garden soils. The arsenic and lead concentrations measured in each flowerbed and garden sampling unit will be compared to the Site remedial action levels for arsenic and lead. The sampling plan has been designed to result in collection of samples that are representative of Site conditions using consistent methods to provide comparable results.

The contract laboratory will analyze the soil samples for arsenic and lead by ICP. Table 4-1 provides the precision, accuracy, quantitation limit, and completeness objectives for arsenic and lead analyses of soil samples by ICP. The representativeness of laboratory analyses will be evaluated from analyses of blanks, including equipment blanks and method blanks.

4.3.2 Yard Soil Composition Sampling

Samples of the existing soil in a portion of the yards scheduled for remediation will be collected and analyzed for composition (i.e., percent clay, silt, and sand) to support an evaluation of the composition requirements for the replacement soil. A sampling plan has been designed to provide representative samples of the soil to be removed, as described in Section 4.2.2. The sampling plan provides representative samples that describe the composition of the existing yard soils. Sample results will be plotted on a textural triangle and used by the Supervising Contractor to identify composition requirements for acceptable replacement soil. The sampling plan has been designed to result in collection of samples that are representative of the target material using consistent methods to provide comparable results.

The selected geotechnical laboratory will analyze the samples by the method specified on Table 4-1.

4.3.3 Disposal Characteristics Sampling

Samples of the soils to be removed during property remediation will be collected and analyzed for leachate concentrations of metal, pesticide, herbicide, semi-volatile and volatile constituents to support management of the material as solid waste. A sampling plan has been designed to provide representative samples from the areas to be removed, as described in Section 4.2.3. The sampling plan provides representative samples that describe the concentrations of the target leachate constituents in the materials scheduled for removal. The measured leachate concentrations will be compared to the toxicity characteristic concentration thresholds for hazardous waste (40 CFR 261), and materials with leachate concentrations that exceed the threshold concentrations will be identified as hazardous waste. The sampling plan has been designed to result in collection of samples that are representative of the target materials using consistent methods to provide comparable results.

The contract laboratory will analyze the samples by the specified methods. The precision, accuracy, quantitation limit, and completeness objectives for the analyses are listed on Table 4-1.

4.3.4 Replacement Material Sampling

Samples of the replacement soil used in property restorations will be collected and analyzed for metal, pesticide, semi-volatile, volatile and PCB criteria constituents to confirm that the materials meet the replacement material chemical criteria. Samples of the replacement gravel will be collected and analyzed for arsenic and lead. A sampling plan has been designed to provide representative samples of the replacement materials, as described in Section 4.2.4. The sampling plan provides a sufficient number of samples from which to describe the concentrations of the target constituents in the replacement materials. The constituent concentrations will be compared to the replacement material chemical criteria to confirm that the replacement materials are acceptable. The sampling plan has been designed to result in collection of samples that are representative of each type of replacement material using consistent methods to provide comparable results.

The contract laboratory will analyze the samples by the specified methods. The precision, accuracy, quantitation limit, and completeness objectives for the analyses are listed on Table 4-1.

4.3.5 Sampling of Ambient Dust

Ambient air monitoring will be performed during construction activities to produce two types of data for evaluating the effectiveness of dust control measures:

- Real time TSP concentration data (which will provide estimates of PM_{10} and $PM_{2.5}$ lead and arsenic concentrations); and
- Arsenic and lead concentration data from TSP samples.

These data will be used for direct comparison to action levels for PM_{10} , $PM_{2.5}$, lead and arsenic and to identify when additional dust control measures are necessary. The Fugitive Emissions Dust Control Plan (Appendix E to the Removal Action Work Plan) provides details of monitoring activities, including quality assurance objectives.

4.4 Sampling Procedures

4.4.1 Garden and Flowerbed Sampling

As discussed in Section 4.2.1, one composite sample will be collected from each flowerbed and garden identified for sampling. The composite sample will be collected by dividing the flowerbed or garden into two approximately equal-area units, and a soil core from the 0-2 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil will then be thoroughly blended and the sample will be collected from the blended material. Specific procedures and protocols to be used to collect the samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A). Information in the SOP includes procedures for delineation of sampling units, sample collection, sample preparation, documentation and equipment decontamination.

4.4.2 Yard Soil Composition Sampling

Samples of the soil in a subset of the yards scheduled for removal will be collected and analyzed to assess its composition of clay, silt and sand. One soil sample will be collected from 10 residential properties across the site. To provide for the results to be representative of the site, samples will be collected as follows: 2 from the Cole neighborhood; 2 from the Clayton neighborhood; 3 from the Elyria

neighborhood (at least one from north and south of I-70); and 3 from the Swansea neighborhood (at least one from north and south of I-70). Within each neighborhood, the Supervising Contractor will select properties that are spatially distant from each other to provide data across the site. More samples will be collected from Elyria and Swansea because they are greater in area than Cole and Clayton.

At each selected property, soil for the sample will be uniformly retrieved over the 0 to 12 inch depth interval at a single location near the center of the yard. Specific procedures and protocols to be followed while collecting the samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A).

4.4.3 Disposal Characteristics Sampling

As discussed in Section 4.2.3, samples of the yard soils to be removed will be collected and analyzed for leachate constituents to support management of the material as solid waste. One composite sample will be collected for every twenty residential properties. The composite sample will be prepared by randomly selecting four of the properties for sampling. The four properties will be identified by numbering the properties from one to twenty and using a spreadsheet-based random number generator to select four properties.

At each of the four properties, the planned excavation area will be divided into four approximately equal-area sampling units. Soil cores from the 0-12 inch depth interval will be retrieved from the approximate center of each unit. The recovered soil from all four sampling locations in the four properties will then be thoroughly blended and the sample will be collected from the blended material. Specific procedures and protocols to be followed while collecting the soil samples are described in the Standard Operating Procedure for Soil Sampling (Attachment A).

4.4.4 Replacement Material Sampling

Samples of the replacement materials (soil and gravel) will be collected and analyzed to confirm that the materials meet the Site clean replacement material chemical criteria and verify the quality control sample results.

Samples will be collected from each type of replacement material at a rate of one sample per 5,000 cubic yards of material used. Each sample will be collected as a single grab sample collected from the transport truck carrying the material, a material stockpile or directly following placement during property restoration. Specific procedures and protocols to be followed while collecting the confirmation soil samples are described in the Standard Operating Procedure for Sampling Replacement Materials (Attachment A).

4.4.5 Sampling of Ambient Dust

Details of sampling procedures for ambient dust are provided in the Fugitive Emissions Dust Control Plan (Appendix E to the Removal Action Work Plan).

4.5 Sample Custody

After samples have been collected, they will be maintained under strict chain-of-custody procedures. The procedures described below document the transfer of custody of the samples from the field to the designated analytical laboratory and the associated documentation requirements. The field sampling personnel will complete a Chain-of-Custody Record and Request for Analysis (CC/RA) form for each shipping container (i.e., cooler or other container) of samples to be sent to the laboratory for analysis. The CC/RA for a shipping container will list only those samples in that shipping container. Information contained on the triplicate carbonless CC/RA form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;
- Method of shipment;
- Carrier/waybill number (if any);

- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is being transferred;
- Date and time of sample custody transfer; and
- Condition of samples upon receipt by laboratory.

The sample collector will cross out any blank space on the CC/RA below the last sample number listed (on the part of the form where samples are listed). A sample label will be affixed to each sample container. The label will be protected with a layer of clear tape, and each container will be sealed using custody seals. Each container will be carefully packaged in a shipping container (typically an ice chest) with Styrofoam peanuts, vermiculite or other packing material, if necessary, to prevent breakage during shipment. Custody seals will be signed and dated by the sample custodian prior to shipment. If the custody seal is broken, the LQAO will immediately notify the Project Chemist.

The sampling personnel whose signature appears on the CC/RA is responsible for the custody of the sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting the sample to the designated laboratory. The sample is considered to be in custody when the sample is: (1) in the direct possession of the sample custodian; (2) in plain view of the sample custodian; or (3) is securely locked in a restricted access area by the sample custodian.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA under "Relinquished by" and "Received by." Signatures, printed names, company names, date and time are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain the third sheet (pink copy) of the CC/RA. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA. Copies, receipts or carbons of Bills of Lading will be retained as part of the permanent documentation in the project file. It is not necessary for courier personnel to sign the CC/RA. When the samples are received by the laboratory, the CC/RA will be immediately signed along with the date and time of receipt. The top sheet (white copy) of the CC/RA will be returned to the Supervising Contractor with the final analytical report.

4.6 Analytical Procedures and Calibration

4.6.1 Analytical Parameters and Methods

The samples will be analyzed for the specified parameters according to the methods listed on Table 4-1. Sample container requirements, preservatives and holding times for the samples are listed on Table 4-2. The specified methods provide data of appropriate quality for comparison to the respective decision criteria.

Flowerbed and garden samples will be analyzed for arsenic and lead by ICP analysis (Method 6010B) following a complete digestion based on USEPA Method 3052 (microwave or hot plate). Equipment blank samples from flowerbed and garden sampling will also be analyzed for arsenic and lead by ICP (Method 6010B).

Samples of the yard soils collected for composition analysis will be analyzed by ASTM Method D-422, or an equivalent method.

Samples collected to support classification of the materials for disposal will be extracted using the appropriate TCLP extraction procedure (Method 1311) and analyzed for metals (Method 6010B/7470), pesticides (Method 8081A), herbicides (Method 8150), semi-volatiles (Method 8270) and volatiles (Method 8260).

Samples of the replacement soil will be analyzed for the replacement material chemical criteria metals (Method 6010B/7470), pesticides (Method 8081A), semi-volatiles (Method 8270), volatiles (Method 8260), and PCBs (Method 8082). Samples of the replacement road base and gravel will be analyzed for arsenic and lead (Method 6010B).

The filters used to collect TSP dust samples will be weighed by the laboratory prior to and after use in order to perform the gravimetric analysis. The filters will then be digested and analyzed for lead and arsenic by USEPA method 6020 (ICP-MS). Additional information concerning the analysis of the dust samples is included in Fugitive Emissions Dust Control Plan (Appendix E of the Removal Action Work Plan).

4.6.2 Field Calibration Procedures

Field instruments will be calibrated prior to use and at prescribed intervals while in use. Procedures for calibration of instruments will be the standard operating procedures as outlined in the owner's manuals for the specific field instruments.

4.6.3 Preventative Maintenance

Field equipment will be inspected, visually and functionally, prior to each day's use at a minimum. Preventive maintenance activities will be documented in the field log book, and will identify the equipment and specify the maintenance tasks completed.

4.7 Data Reduction, Validation and Reporting

4.7.1 Field Measurement Data

Field measurements will be obtained from the MiniRAM sampler during construction activities. Details concerning the collection, management, and evaluation of the data obtained from the MiniRAM sampler are provided in the Fugitive Emissions Dust Control Plan (Appendix E of the Removal Action Work Plan).

4.7.2 Laboratory Measurement Data

Laboratory calculations and data review by the laboratory will be performed in accordance with procedures prescribed by the specific analytical method. The laboratory will review the results of laboratory QC analyses, instrument calibration and maintenance records, calculations, and the record of sample custody (including holding times) within the laboratory. The laboratory data packages will include:

- Copies of the Chain-of-Custody records;
- Sample results and units;
- Date analyzed;
- Analytical method;

- Quantitation limits;
- Laboratory QC results (laboratory control samples, matrix spikes, etc.); and
- Method blank result.

The data packages from the analyses will be used for validation and will also include back-up information concerning instrument calibration, sample preparation, sample run logs, and analytical raw data. Analytical data packages will be sent directly from the laboratory, in a hard-copy format, to the Project Chemist. The data will be reviewed by the Project Chemist or EQAO, as described below, and will be reported as described in Section 4.7.5.

4.7.3 Data Review and Evaluation

Upon receipt of the analytical results and data packages from the laboratory, the data will be reviewed by the Project Chemist or the EQAO for accuracy, precision, and completeness. The analytical data will be reviewed for the following items:

- Analyses performed and sample identifications conform to the information on the Chain-of-Custody records;
- Sample holding times;
- Specified quantitation limits (Table 4-1);
- Laboratory QC results (laboratory control samples, matrix spikes) meet measurement objectives (Table 4-1);
- Target analyte concentrations in method and equipment blanks; and
- Reproducibility of field duplicate results.

Data that satisfy the quality assurance objectives for this project will be considered usable for comparison to the appropriate standards identified in Section 4.2. If anomalies or nonconformances are discovered, the laboratory will be instructed to review the submitted data and the methods used to obtain the data. Laboratory or field QC sample results that do not meet the QA objectives will be evaluated to determine whether the sample data are usable. Corrective actions, as necessary, will be implemented per the procedures described in Section 4.11.

4.7.4 Data Validation

The data obtained from the analyses will be validated according to the procedures provided in the USEPA Functional Guidelines for Inorganic Data Review (USEPA, 1994) or the USEPA Functional Guidelines for Organic Data Review (USEPA, 1999). If anomalies or nonconformances are discovered, the laboratory will be instructed to review the submitted data and the methods used to obtain the data. Laboratory QC or field QC sample results that do not meet the QA objectives will be evaluated to determine whether the data are potentially biased and whether data qualifiers should be applied. Corrective actions will be implemented, as necessary, per the procedures described in Section 4.11. Unless rejected by the data validator, all validated data will be considered usable for comparison to the applicable standards. Data rejected by the data validator will not be considered usable.

4.7.5 Data Management and Reporting

Field measurements and laboratory analytical results will be presented in the monthly and annual progress reports. The laboratory data will be tabulated to include the following:

- Sample location;
- Sample identification;
- Date of sample collection;
- Analytical method;
- Analytes and measured concentrations;
- Quantitation limits; and
- Laboratory qualifiers.

Copies of field and laboratory reports will be maintained by the Supervising Contractor during the course of the project at the site.

4.8 Internal Quality Control Checks

Internal QC will be achieved by collecting and/or analyzing a series of field and laboratory QC samples to ensure that the analytical results meet the measurement objectives detailed in Section 4.3. Results from analyses of QC samples are used to quantify precision and accuracy and identify any problems or limitations of those data.

4.8.1 Field Quality Control Checks

Field QC will be controlled by compliance with standard sample collection and handling methods and by the periodic collection of field QC samples. QC samples will be collected as blind samples so that the laboratory remains unaware of the nature of those samples and performs analyses identically to the sample analyses. The appropriate types and frequency of field QC samples depend on the sample type, sample matrix and intended data use.

Three types of quality control samples will be collected during construction-related environmental sampling: equipment blanks, field duplicates, and air filter blanks.

Equipment blanks consist of analyte-free reagent water (i.e., ASTM Type II) poured through the sampling device or equipment, collected in a clean sampling bottle, preserved as needed, and analyzed with the samples. Equipment blanks may be used to demonstrate that sampling devices have been adequately cleaned between uses and provide representative samples.

A field duplicate sample is a second sample collected at the same location as the original sample. It is collected simultaneously with or in immediate succession to the original sample using identical recovery techniques, and it is treated in an identical manner during storage, transportation and analysis. Field duplicate sample results may be used to provide a measure of method variability, including both sampling and analytical precision. Field duplicates will be collected for dust samples, as described in the Fugitive Emissions Dust Control Plan (Appendix E of the Removal Action Work Plan).

An air filter blank consists of an air filter that has not been exposed to air drawn through the sampler. The filter blank is prepared from an unused filter that has been pre-weighed by the laboratory. The filter blank is submitted for analysis in an identical manner as the filters used for sampling, and it is analyzed for the same parameters as the sample filters. Filter blank results describe the background TSP and arsenic and lead concentrations of filters used to collect ambient dust and may be used to assess bias introduced as a result of measurement error or blank concentrations.

4.8.1.1 Garden and Flowerbed Samples

Equipment blanks will be collected with the flowerbed and garden samples. Equipment blanks will be collected by pouring reagent water through the decontaminated re-usable equipment used to obtain and composite soil subsamples (e.g., soil scoops and mixing bowls). One equipment blank will be collected with every 20 soil samples submitted for laboratory analysis. Equipment blanks associated with flowerbed and garden sampling will be analyzed for arsenic and lead.

4.8.1.2 Yard Soil Composition Sampling

No field QC samples will be collected during the yard composition sampling.

4.8.1.3 Disposal Characteristics Samples

No field QC samples will be collected with the disposal characteristics samples. Given the nature of the sample collection/compositing procedures and subsequent extractions and analyses, it is unlikely that poor equipment decontamination would bias the sample results. Therefore, field audits of the equipment decontamination procedures will be used as the quality check and no equipment blanks will be collected.

4.8.1.4 Replacement Material Samples

No field QC samples will be collected with the replacement material samples. Disposable sampling equipment will be used to obtain the samples. Therefore, no equipment decontamination or quality check (equipment blank) of the decontamination procedure will be needed.

4.8.1.5 Ambient Dust (TSP) Samples

Filter blanks will be collected with the ambient TSP dust samples at a frequency of one for every 20 filter samples. The filter blank will be collected by containerizing an unused, pre-weighed filter and submitting it for the same analyses as the TSP filters (TSP, lead and arsenic). The filter blanks will be blind blanks sent to the laboratory. In addition, field duplicates will be collected once each month (see the Fugitive Emissions Dust Control Plan for details.)

4.8.2 Laboratory Quality Control Checks

Laboratory quality control is necessary to control the analytical process, to assess the precision and accuracy of analytical results and to identify assignable causes for atypical analytical results. The internal QC practices of the contract laboratory will provide quality control for laboratory analyses. Initial calibration will be performed for all analytical methods. The measurement objectives for the QC samples are identified on Table 4-1. The laboratory's other QC practices vary depending on the analysis performed, as described below.

For all constituent analyses, the laboratory will analyze and report the results from method blanks, analytical duplicates and matrix spike samples, as applicable. These data will be used to evaluate data quality relative to the measurement objectives given in Section 4.3. In addition, initial and continuing calibration verifications will be performed. Calibration results must meet the laboratory's acceptance criteria.

The precision and accuracy of gravimetric measurements will be controlled through replicate measurements and instrument calibration. One in 10 measurements will be replicates. The scale used to weigh filters will be calibrated and calibration checks will be performed at least daily. In addition, LCS and Matrix Spikes will be analyzed to verify the precision and accuracy of the analytical method, as described previously.

4.9 Technical System Audits

The purpose of a quality assurance audit is to provide an assessment of the ability of the measurement system to produce data of a quality commensurate with the project's measurement objectives. In addition to documenting the performance of the sampling, analytical and data management systems, the audit provides a mechanism whereby inadequacies in the measurement systems can be identified and necessary corrective actions implemented in a timely manner.

Internal technical systems audits of field and/or laboratory activities may be performed during construction-related activities. Internal audits will be performed by the EQAO. The USEPA may also perform external systems audits.

An individual audit plan will be developed to provide a basis for each audit. This plan will identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. Checklists will be prepared by the auditors to structure the review process and document the results of the audit.

4.9.1 Systems Audits

A technical systems audit is an on-site, qualitative review of the various aspects of a total sampling and/or analytical system. It consists of observations and documentation of all aspects of the measurement effort, including adherence to approved sampling and analysis plans, quality assurance plans and standard operating procedures. A systems audit also includes review of record keeping and data handling systems, including:

- Calibration documentation;
- Completeness of data forms and notebooks;
- Data review and validation procedures;
- Data storage and filing procedures;
- Sample custody procedures;
- Documentation of QC data;
- Documentation of maintenance activities; and
- Corrective action reporting procedures.

A technical systems audit will include an audit plan, schedule, audit scope and checklists. An audit report will be prepared for the construction oversight manager with recommendations for corrective action, if needed.

4.9.2 Frequency and Scheduling

The necessity for internal systems audits will be determined by the Supervising Contractor's PM or EQAO. Audits will be scheduled at intervals appropriate to assure quality control for the activity type or task in progress and will be planned to coincide with appropriate activities on the project calendar. Such scheduled audits may be supplemented by additional audits for one or more of the following reasons:

- When significant changes are made in the QA plan;
- When it is necessary to verify that corrective action has been taken on a nonconformance reported in a previous audit; or
- When requested by the Supervising Contractor's PM or EQAO.

4.9.3 Audit Reports

During an audit and upon its completion, the auditor may discuss the findings with the individuals audited, and discuss and agree on corrective actions to be initiated. Minor administrative findings which can be resolved to the satisfaction of the auditor during an audit may not be cited as items requiring corrective action. Findings that are not resolved during the course of the audit, and findings affecting the overall quality of the project, will be noted on the audit checklists and included in the audit report.

Audit results will be reported to the Supervising Contractor's PM and FPS. The audit report will be retained in the project file, and copies of audit reports will be included in progress reports prepared by the Supervising Contractor for USEPA.

The PM will submit a reply to the audit report addressing each finding cited, the corrective action(s) to be taken and a schedule for implementation. This reply will be sent to the auditor and will be filed in the project file. The findings cited in the audit and addressed in the reply will be treated as nonconformances and will become subject to review at the time of the next audit.

4.10 Calculation of Data Quality Indicators

The parameters that will be used to assess data quality include accuracy, precision, completeness and representativeness. Definitions of these parameters are provided below. Since the environmental sampling data will be used to evaluate and direct construction-related activities, the accuracy and representativeness of the data will be considered the data quality parameters of most importance. The field and laboratory QC samples and methods that will be employed to assess the data quality are discussed in Section 4.8.

4.10.1 Precision

Precision (analytical error) is the level of agreement among repeated measurements of the same characteristic. Data precision will be assessed by determining the agreement among replicate measurements of the same sample and measurements of duplicate samples. As discussed in Section 4.8, these samples will include MS/MSD samples, LCS/LCSD samples, and field duplicates. The comparison is made by calculating the relative percent difference (RPD), given by:

$$RPD(\%) = \frac{|S_1 - S_2|}{(S_1 + S_2)/2} \times 100$$

where: S_1 = measured sample concentration; and
 S_2 = known sample or duplicate concentration.

The goals for precision are provided in Section 4.3, Quality Assurance Objectives. When analytes are present at concentrations below or near the quantitation limit, precision will be evaluated using duplicates of a matrix-spike sample (if available).

4.10.2 Accuracy

Accuracy (bias) is the degree of difference between measured or calculated value and the true value. Data accuracy will be evaluated using sample recoveries, expressed as the percentage of the true (known) concentration, from laboratory-spiked samples (including matrix spikes) and from standard reference materials (i.e., laboratory control standards) generated by the analytical laboratory (see Section 4.8). Equipment, field and laboratory blanks will be analyzed to quantify artifacts introduced during sampling, transport, or analysis that may affect the accuracy of the data. The percentage recovery for spiked samples will be used to evaluate the accuracy of analyses as given by:

$$Recovery(\%) = \frac{A - B}{T} \times 100$$

where: A = measured concentration of the spiked sample;
 B = concentration of unspiked sample; and

T = amount of spike added.

In addition, the initial and continuing calibration results will be reviewed to verify that the sample concentrations are accurately measured by the analytical instrument. The project goals for accuracy are provided in Section 4.3, Quality Assurance Objectives.

4.10.3 Completeness

Completeness is the percentage of valid measurements (data points) obtained, as a proportion of the number of measurements (data points) planned for the investigation. Completeness is affected by such factors as sample-bottle breakage, and acceptance/non-acceptance of analytical results. Percentage completeness (C) is given by:

$$C(\%) = \frac{V}{P} \times 100$$

where: V = number of valid measurements (data points) obtained by the investigation;
and

P = number of measurements (data points) planned for the investigation.

Completeness goals are provided in Section 4.3, Quality Assurance Objectives.

4.10.4 Representativeness

Representativeness is a qualitative objective, defined as the degree to which data accurately and precisely represent the medium being studied. Representativeness is achieved by collecting a sufficient number of unbiased samples, as determined through the QA objectives. Representativeness will be evaluated based on blank results (field and laboratory), laboratory methods and QC, sampling locations and methods, and sampling frequencies. Samples will be collected in accordance with the methods described in this CQAP to ensure that the samples are representative of the site conditions. The samples will be contained, preserved, and stored appropriately, as discussed in Section 4.5. Laboratory blanks, calibration standards and methods, and QC sample results will be reviewed as described in Sections 4.6 and 4.7 to ensure that analytical results are representative of actual site conditions.

4.11 Corrective Action

Nonconforming equipment, items, activities, conditions and unusual incidents that could affect compliance with project quality assurance goals will be identified, controlled and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate. Project staff, a project subcontractor, or analytical laboratory personnel will inform the FPS or Project Chemist (as applicable) immediately when a nonconformance is identified or suspected. The Project Chemist or FPS will in turn notify the EQAO to discuss the nonconformance and identify an appropriate response, the "corrective action".

If the analytical results of laboratory control samples fall outside of the project's control limits, the laboratory will initiate corrective actions. The EQAO will also review field data and narrative records related to the samples in question for the potential source of the error. If the laboratory cannot correct the situation that caused the nonconformance and an out-of-control situation continues to occur or is expected to occur, the laboratory will immediately contact the Supervising Contractor's PM or EQAO. Completion of corrective action should be evidenced by data once again falling within prescribed quality control limits. If an error in laboratory procedures or sample collection and handling procedures can not be found, the Supervising Contractor's PM will review the results and assess whether reanalysis or resampling is required.

4.12 Quality Assurance Reports

Effective management of the environmental sampling effort requires timely assessment and review of field activities that in turn requires effective interaction and feedback between the FPS, EQAO and PM.

The FPS will be responsible for documenting any conditions or situations that might adversely affect data quality. These conditions should be communicated in writing to the EQAO and PM. In addition, routine quality assurance reports will be prepared by the FPS for the EQAO and PM. These reports will include elements such as project activities, modifications to or deviations from the CQAP and any corrective actions taken, status of unresolved problems and audit results. These reports may be provided as informal memos or other documented presentations.

Data quality evaluations will be prepared by the EQAO, based on the procedures described in Section 4.7. The usability of data will be determined and described. The impact of any deviations or exceptions to the method protocols or performance indicators will also be described. This information will be provided in data quality reports prepared for the PM and included in the Construction Completion Report.

5.0 CONSTRUCTION DOCUMENTATION & REPORTING

This section presents a summary of the construction documentation necessary for the pre-removal action sampling phase, the construction startup phase, the construction inspection and QA/QC procedures, the construction management and contract administration procedures, and the construction phase closeout.

5.1 Pre-Removal Action Sampling Phase

The pre-removal action sampling phase is the time period during which the Supervising Contractor will perform activities necessary to support the removal action construction phase. The primary activities during this phase will include collection and analysis of the flowerbed and garden samples, collection and analysis of yard soil composition samples and collection and analysis of the disposal characteristics samples. These activities may be conducted in conjunction with or in advance of the construction start-up phase, as applicable.

Reporting requirements during this phase will include the documentation of sample collection and analysis activities as specified in Section 4.0. Required reports will include daily reports associated with field sampling, laboratory analytical reports and data validation reports. These reports will be prepared by the Supervising Contractor's FPS, Project Chemist/EQAO and the contract laboratory. Summaries of these reports will be provided to the USEPA WAM in the form of monthly progress reports prepared by the Supervising Contractor's PM.

5.2 Project Startup Phase

The project startup phase includes the period between the award of the removal action construction contract(s) and mobilization of the construction contractor(s) to the site. The principal item required for planning during this phase of the project is development of a submittal control sheet listing all required contractor submittals in the order in which they appear in the technical specifications. This will be prepared during the construction bidding process. Summaries of the actions accomplished during the project start-up phase will be provided to the USEPA WAM in the monthly progress reports prepared by the Supervising Contractor's PM.

5.3 Construction Phase

The construction phase of the project includes the period between contractor mobilization and substantial completion of the project. The basic reporting required for construction inspection during this phase of the project will include the daily record of work progress (by the FPS), which will include the weather conditions, the contractor's work force, site visitors, the equipment used and the general construction activities. Records associated with air monitoring will be maintained per the requirements of the Fugitive Emissions Dust Control Plan. Additional reporting procedures will include the actual log of contractor submittals including the action taken on each submittal, laboratory analytical reports generated by the contract laboratory, and data validation reports prepared by the Project Chemist/EQAO. Records for QC and QA activities described in this CQAP will be maintained by the FPS with periodic submittal to the USEPA WAM as requested. Construction progress reports, which summarize the activities performed and the data generated, will be prepared by the Supervising Contractor's PM and provided to the USEPA WAM on a monthly basis and at the end of each construction season.

6.0 REFERENCES

- U.S. Environmental Protection Agency (USEPA), 1994. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. USEPA 540/R-94/013, Office Emergency and Remedial Response. February.
- U.S. Environmental Protection Agency (USEPA), 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. USEPA 540/R-99/008, Office of Emergency and Remedial Response.
- Washington Group 2001. Remedial Investigation Report for Operable Unit 1 Vasquez Boulevard/Interstate 70 Superfund Site. Prepared by Washington Group International for USEPA.

TABLES

TABLE 3-1
Summary of Construction Quality Control/Quality Assurance Monitoring & Testing

Item	Construction Element	Parameter	Acceptance Criteria	Construction Quality Control (by Construction Contractor)		Construction Quality Assurance (by Supervising Contractor)	
				Method	Minimum Frequency	Method	Minimum Frequency
I. PRE-REMEDIAL CHARACTERIZATION							
A.	Gardens & Flower Beds	Arsenic & Lead	Arsenic and Lead concentration below Site residential action level	-	-	EPA 6010B	Each Sampling Unit
						Equipment Blank	1/20 samples
B.	Yard Soil Composition	Texture and particle size	Establish replacement soil requirements	-	-	ASTM D422	10 properties total
C.	Disposal Characteristics	Leachable (TCLP) Metals Pest/Herb SVOCs/VOCs	Meets disposal site requirements	-	-	EPA 1311/6010B/7470 1311/8081A/8150 1311/8270/8260	1/20 properties
II. REMEDIATION CONSTRUCTION							
A.	Soil Removal	Excavation extent	Remove soil to marked limits shown on Site Remediation Map	Visual observation	Each property	Visual observation	Each property
		Excavation depth	12 inches, min. (4 inches under decks)	Elevation Survey	1 point/ 500 ft ² , min. 3 points/excavation	Visual observation and random spot checks with tape measure; review Contractor's survey data	Each property
		Fugitive dust emissions	No visible dust emissions. Field and laboratory monitoring results confirm compliance with Fugitive Emissions Dust Control Plan	Visual Inspection	Continuous	Field and laboratory monitoring as specified in the Fugitive Emissions Dust Control Plan	As specified in the Fugitive Emissions Dust Control Plan
B.	Replacement Soil	Arsenic & Lead	Arsenic & Lead concentrations meet residential soil criteria	EPA 6010B	Source approval + 1/1000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						EPA 6010B	1/5 samples
		Texture and particle size	Meets textural and particle size requirements	ASTM D422	Source approval + 1/5000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						Review test results for acceptability. Observe material for changes in consistency	Continuous
		Metals Pest/PCB SVOCs/VOCs	Meets residential soil criteria	EPA 6010B/7470 8081A/8082 8270/8260	Source approval and when requested based on observed material change	EPA 6010B/7470 8081A/8082 8270/8260	1/5000 cy
Replaced Thickness	12 inches, min. 4 inches, min. (under decks)	Grade Stakes	1 stake/ 500 ft ² , min. 3 stakes/excavation	Visual observation and random spot checks with additional grade stakes	Each property		

TABLE 3-1
Summary of Construction Quality Control/Quality Assurance Monitoring & Testing

Item	Construction Element	Parameter	Acceptance Criteria	Construction Quality Control (by Construction Contractor)		Construction Quality Assurance (by Supervising Contractor)	
				Method	Minimum Frequency	Method	Minimum Frequency
C.	Replacement Gravel	Arsenic & Lead	Arsenic & Lead concentrations meet gravel criteria	EPA 6010B	Source approval + 1/1000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
						EPA 6010B	1/5 samples
		Gradation	Meets gradation requirements	ASTM D422	Source approval + 1/5000 cy and when requested based on observed material change	Review test results for acceptability. Observe material for changes in consistency	Continuous
		Replaced Thickness	4 inches, min.	Grade Stakes	1 stake/ 500 ft ² , min. 3 stakes/excavation	Visual observation and random spot checks with additional grade stakes	Each property
D.	Replacement Vegetation	Vegetation Extent	Install vegetation as specified on Site Remediation Plan	Visual Confirmation	Each Area	Visually observe and confirm vegetation placement	Each Area
		Vegetation Type	Meets vegetation type and quality requirements	Provide labels and certificates provided by supplier	1/source & type	Review submittals for acceptability	1/source & type
		Fertilizer	Applied in accordance with manufacturer's recommendations	Provide MSDSs & manufacturer's recommended application procedures	1/source & type	Review submittals for acceptability. Observe field procedures	1/source & type
		Vegetation Condition	All replacement vegetation shall be in good condition at end of maintenance/watering period	Visual Inspection at end of maintenance/watering period	Each Property	Visual Inspection at end of maintenance/watering period	Each Property

TABLE 4-1
QUANTITATIVE MEASUREMENT OBJECTIVES FOR ANALYSES
SOIL, REPLACEMENT MATERIALS AND WATER SAMPLES

Sample Matrix	Analytical Method Description	EPA Method Reference	Precision	Accuracy	Completeness
Flowerbed & Garden Soil	ICP (Arsenic and Lead)	6010B; 3052 - 1 hydrofluoric acid digestion	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
In-situ Yard Soil	TCLP – Metals	1311/ 6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	TCLP – Mercury	1311/ 7471A	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	TCLP – Pesticides	1311/ 8081A	LCS/LCSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Herbicides	1311/ 8151A	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Semi-volatiles	1311/ 8270C	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	TCLP – Volatiles	1311/ 8260B	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	Soil Composition	ASTM D-422	N/A	N/A	95

Replacement Materials	Metals ⁽¹⁾	6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	Mercury	7471A	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <30%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95
	Pesticides ⁽¹⁾	8081A	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	PCBs ⁽¹⁾	8082	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	Semi-volatiles ⁽¹⁾	8270C	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
	Volatiles ⁽¹⁾	8260B	LCS/LCSD or MS/MSD RPD = within lab control limits Analytical duplicate RPD = <30%	LCS = 75 – 125% Lab Blank = < MDL	95
Water – Equipment Blanks	ICP (Arsenic and Lead)	6010B	LCS/LCSD or MS/MSD RPD = <20% Analytical duplicate RPD = <20%	LCS = 80 – 120% recovery MS = 75 – 125% recovery Lab Blank = < MDL	95

Notes: ⁽¹⁾ All replacement materials will be analyzed for the analytes listed on the Replacement Material Chemical Criteria. Only those constituents shall be reported.

TABLE 4-2
ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Sample Matrix	Analytical Method Description	EPA Method Reference	Container and Preservation	Storage Recommendation	Holding Time Recommendations
Flowerbed & Garden Soil	ICP (Arsenic and Lead)	6010B; 3052-hydrofluoric acid digestion	Clean bags or glass jars 50 grams	None	180 days
In-situ Yard Soil	TCLP – Metals	1311/ 6010B	Clean 8 oz. glass jar	Cool	180 days
	TCLP – Mercury	1311/ 7471A			14 days
	TCLP – Pesticides	1311/ 8081A	Clean 8 oz. glass jar	Cool	Extraction = 7days Analysis = 40 days after extraction
	TCLP – Herbicides	1311/ 8151A			Extraction = 7days Analysis = 40 days after extraction
	TCLP – Semi-volatiles	1311/ 8270C			Extraction = 7days Analysis = 40 days after extraction
	TCLP – Volatiles	1311/ 8260B			14 days
	Soil Composition	ASTM D-422	Clean 5-gallon bucket	N/A	N/A

Replacement Materials	Metals ⁽¹⁾	6010B	Clean 8 oz. glass jar 50 grams	Cool	180 days
	Mercury	7471A			14 days
	Pesticides ⁽¹⁾	8081A	Clean 8 oz. glass jar 100 grams	Cool	Extraction = 7days Analysis = 40 days after extraction
	PCBs ⁽¹⁾	8082			Extraction = 7days Analysis = 40 days after extraction
	Semi-volatiles ⁽¹⁾	8270C			Extraction = 7days Analysis = 40 days after extraction
	Volatiles ⁽¹⁾	8260B	Clean 8 oz. glass jar 50 grams	Cool	14 days
Water – Equipment Blanks	ICP (Arsenic and Lead)	6010B	Plastic or glass bottle 500 mL Preserve to pH < 2 with nitric acid	N/A	180 days

Notes: ⁽¹⁾ All replacement materials will be analyzed for the analytes listed on the Replacement Material Chemical Criteria. Only those constituents shall be reported.

ATTACHMENTS

ATTACHMENT A
STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE FOR SOIL SAMPLING

1.0 PURPOSE AND SCOPE

The procedures included herein apply to all investigative soil sampling performed during removal actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for collecting soil samples from residential properties are provided. Samples will be collected from: 1) garden and flowerbed areas for analysis of arsenic and lead content; 2) yards scheduled for removal for soil composition analyses; and 3) yard excavation areas for analysis of leachate metal, pesticide, herbicide, semi-volatile and volatile constituent concentrations (disposal characteristics).

2.0 TRAINING AND QUALIFICATIONS

All personnel performing these procedures will be trained in the use of these procedures, have significant relevant sampling experience as approved by the project manager and be experienced in sample handling, documentation and shipping.

3.0 EQUIPMENT AND SUPPLIES

The following equipment and supplies will be used to collect investigative soil samples:

- Coring probes, 2-inch minimum diameter, lead-free. The probes must be capable of being forced into hard ground to a depth of up to 6 inches without being damaged. A number of devices can be utilized as a coring probe. Examples include: plastic or steel pipe and a professional stainless steel coring probe equipped with plastic liners, cross T-bar, and hammer.
- Stainless steel bowls, two gallon size or larger.
- Stainless steel spoon, large serving size.
- Shovel, standard size.
- Sample collection container, new containers of the size and type specified in the project Construction Quality Assurance Plan (CQAP) for the sample.

- Steel or plastic measuring tape or ruler, divisions to at least 1/8 inch.
- Field notebooks, bound with individually numbered pages, see Section 4.
- Indelible ink marker, black or blue.
- Ink pens, black or blue.
- Packaging tape, used for sealing shipping containers.
- Plastic bags, trash bags with ties.
- Plastic gloves, powderless. Gloves with powder should not be used to avoid potential contamination of samples from powder material.
- Preprinted field forms (Exterior & Sample Location Map forms) preprinted with sufficient entry lines to address documentation needs presented in subsection.
- Shipping containers, cardboard or plastic for interim storage and shipment of sample collection containers.

4.0 SAMPLE COLLECTION PROCEDURES

The objectives of the residential sampling program and procedures for identifying properties to be sampled are described in the project CQAP. Soil samples will be collected from gardens and flowerbed areas and from yard excavation areas according to the following procedures.

4.1 Garden and Flowerbed Sampling

Soil samples will be collected from each garden or flowerbed sampling unit by subdividing the sampling unit into two approximately equal-sized sub areas. One soil sample will then be collected from the 0 to 2 inch depth interval at the approximate center of each sub area and composited according to the following procedure:

1. At the subsample location, begin by clearing a circular area approximately 4 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).

2. Advance the decontaminated coring probe into the underlying soil to the required 2-inch depth. Retrieve the coring probe and remove the collected soil into a decontaminated bowl. Verify with the tape measure or ruler that soil has been collected over the full 0 to 2 inch depth interval.
3. Repeat steps 1 and 2 at the center of the second sub area.
4. Thoroughly homogenize the soil in the bowl using a decontaminated stainless steel spoon. Then scoop soil from random locations in the bowl into the sampling container until the sampling container has been filled. If any large rock fragments or large foreign materials (e.g., paper or plastic trash, nails, etc.) are present, these may be removed from the sample container. Seal and label the container.
5. Fill the probe holes with the left over soil from the bowl, tamp down fill and replace vegetation or sod over fill surface.

Equipment used to collect the soil samples will be decontaminated after each sampling unit. However, it will not be necessary to decontaminate the sampling equipment between sub areas that comprise a single sample. Decontamination procedures are provided in the SOP for Sampling Equipment Decontamination.

4.2 Yard Composition Sampling

A soil sample will be collected from each yard selected for soil composition sampling. The soil sample will be collected from the 0 to 12 inch depth interval near the center of the yard according to the following procedure:

1. At the sample location, begin by clearing a circular area approximately 18 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).
2. Using a shovel that is free of accumulated solids, retrieve soil evenly from the 0 to 12 inch depth interval and place it into a clean 5 gallon bucket. Repeat until bucket is approximately $\frac{3}{4}$ full. Cover the bucket with a clean lid.
3. Fill the soil hole with commercially available topsoil or potting soil and tamp down.

Shovels used to collect the soil shall be cleaned by scraping off any accumulated soil and leaving the soil at the sampling location. It will not be necessary to decontaminate the sampling equipment used to collect the yard composition samples.

4.3 Disposal Characteristics Sampling

One composite sample will be collected from every twenty properties scheduled for remediation. The composite sample will be prepared by randomly selecting four of the properties for sampling using a spreadsheet-based random number generator routine. One composite sample will then be collected from the four properties according to the following procedure:

1. At each selected property, the exposed soil areas (yards, unpaved driveways and unpaved parking areas) will be subdivided into four approximately equal-sized sampling units (sub areas). One soil sample will then be collected from the approximate center of each sub area as follows:
 - Begin by clearing a circular area approximately 4 inches in diameter of any surface covering such as mulch, loose debris, vegetation or sod (if present).
 - Advance the decontaminated coring probe into the underlying soil until it is full. Retrieve the coring probe and remove the collected soil into a decontaminated bowl. Repeat this procedure until soil has been collected over the full 0 to 12 inch depth interval, as verified with the tape measure or ruler.
 - Repeat this procedure to collect samples from the center of the three remaining sub areas.
 - Thoroughly homogenize the soil in the bowl. Then remove a volume slightly greater than $\frac{1}{4}$ of the sample container by scooping soil from random locations in the bowl into a second decontaminated bowl.
 - Fill the probe holes with soil from the original bowl, tamp down fill and replace vegetation or sod over fill surface.
2. Repeat the procedures in Step 1 at the three remaining properties to produce four bowls of homogenized soil.
3. Next combine and thoroughly homogenize the four bowls of soil in a single decontaminated bowl. Scoop soil from random locations in the final bowl into the sampling container until the sampling container has been filled. If any large rock fragments or large foreign materials (e.g., paper or plastic trash, nails, etc.)

are present, these may be removed from the sample container. Seal and label the container.

Equipment used to collect the soil samples will be decontaminated after the final composite sample is collected. However, it will not be necessary to decontaminate the sampling equipment between yards that comprise a single sample. Decontamination procedures are provided in the SOP for Sampling Equipment Decontamination.

4.4 Documentation

The sampling team will maintain field notes describing date and time of sampling, weather conditions, personnel present, special instructions, property contact information and sample numbers and sample storage or shipping information. The following information will also be recorded on the Soil Sampling Form:

- Date
- Property block and lot number (if available)
- Property address
- Sampling team members
- Sample numbers
- Location description, including depth
- Soil description

In addition, a site map will be prepared to show the location of the main residence, garage, and significant outbuildings, approximate property boundaries, garden and flowerbed areas, and sample locations. The sub sample locations will be clearly labeled, and the areas represented by each composite sample will be delineated on the site map. This information will be recorded on an Exterior & Sample Location Map form (attached). The Exterior & Sample Location Map form will be forwarded to the Supervising Contractor's Project Manager for inclusion in the hard copy property file.

Sample custody procedures (sample delivery and pick-up information) will be followed in accordance with the SOP for Sample Handling and Documentation. A copy of chain-of-custody form will be included in the hard copy property file.

5.0 EQUIPMENT CALIBRATION AND MAINTENANCE

Soil sampling equipment will be inspected for damage or wear after each sampling day. Worn or unusable equipment will be replaced immediately.

6.0 REFERENCES

U.S. Environmental Protection Agency, 1995. Residential Sampling for Lead: Protocols for Dust and Soil Sampling, EPA Doc. No. 747-R-95-001, March.

Exterior & Sample Location Map

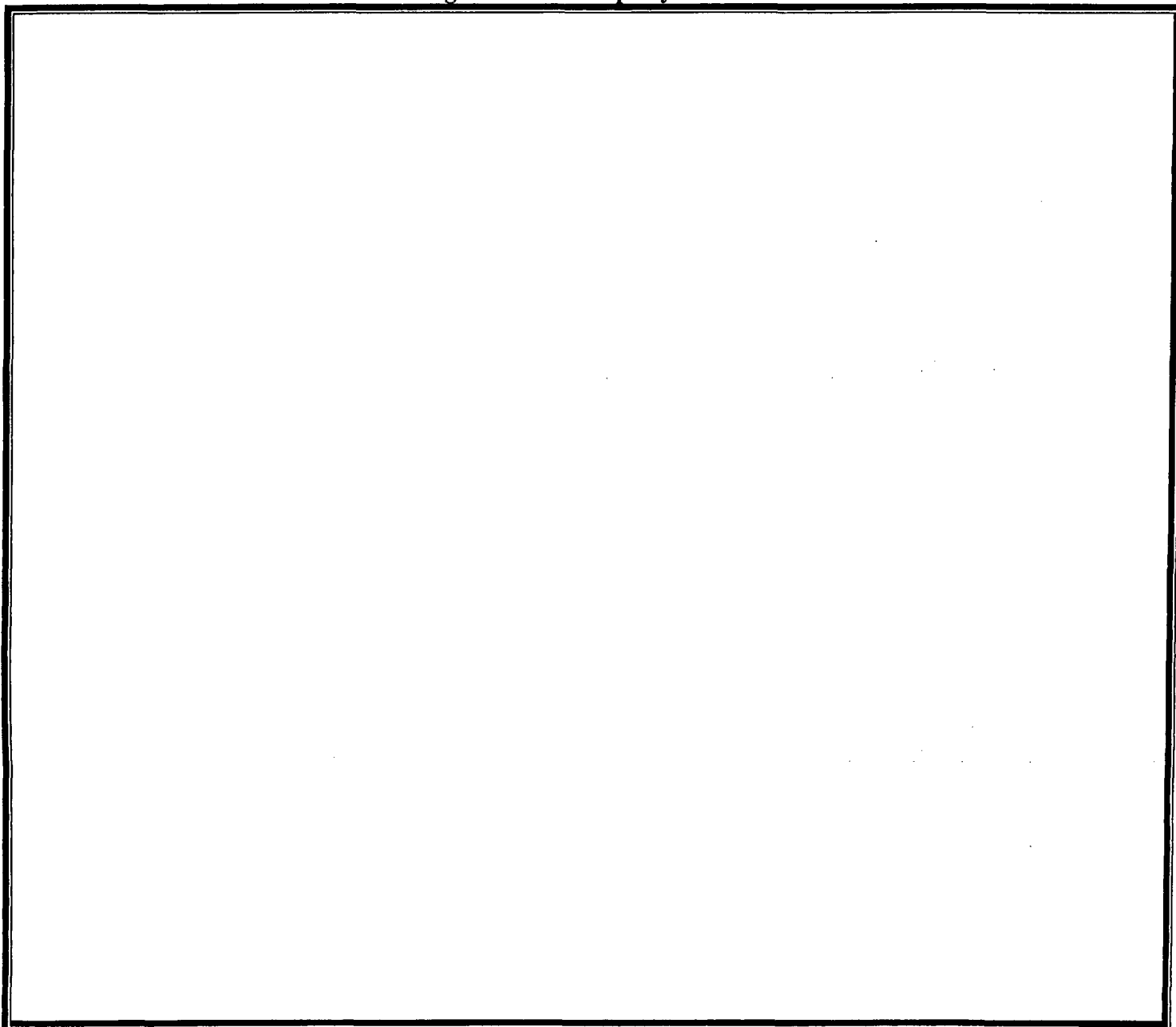
Date: _____ Technician(s): _____

Property No.: _____

Property Address: _____

Notes: _____

Diagram of the Property Exterior



STANDARD OPERATING PROCEDURE FOR SAMPLING REPLACEMENT MATERIALS

1.0 PURPOSE AND SCOPE

These procedures apply to sampling of replacement materials used in removal actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for collecting samples of the replacement soil are provided. Samples of the replacement soils will be collected and analyzed for: 1) physical properties, 2) arsenic and lead content and 3) selected metals, pesticides, herbicides, semi-volatiles, volatiles and PCBs. Samples of replacement road base and gravel will be collected and analyzed for: 1) physical properties and 2) arsenic and lead content.

2.0 TRAINING AND QUALIFICATIONS

All personnel performing these procedures must be trained in their use and experienced in soil sampling, sample handling and sample shipping, as approved by the project manager.

3.0 PROCEDURES

Grab samples of clean replacement materials will be collected from transport trucks, material stockpile or directly following placement.

3.1 Equipment

The following is a list of equipment needed to collect the replacement samples.

- Sample collection container: new containers of the size and type specified in the Construction Quality Assurance Project Plan (CQAP)
- Plastic or stainless steel spoon, trowel or shovel
- Field notebook
- Clipboard
- Indelible ink marker
- Plastic bags for trash

3.2 Sample Collection Procedures

Each sample will be a single grab sample. Grab samples will be collected by directly

scooping materials from the transport truck, stockpile or final placement location. The sampler will randomly select sampling locations. Sampling will be performed at the frequency specified in the CQAP.

3.3 Documentation

The following information will be recorded on the sample label and in a field notebook for each fill sample:

- Date and time of sampling
- Sampler name
- Sample location
- Original source of fill
- Notes from visual inspection of material, including size, type of materials, etc.
- Sample number identifier
- Analyses requested
- Laboratory

This information will be retained by the Supervising Contractor's Field Project Supervisor in hard copy files.

STANDARD OPERATING PROCEDURE FOR SAMPLING EQUIPMENT DECONTAMINATION

1.0 PURPOSE AND SCOPE

These procedures apply to investigation and replacement material sampling performed during removal actions for Operable Unit No. 1, Off-Facility Soils, of the VB/170 Superfund Site. Methods for decontaminating soil sampling equipment are provided.

2.0 PROCEDURES

Equipment used to collect samples will be decontaminated prior to each use, but decontamination will not be required between collection of sub samples of a single composite sample. The equipment requiring decontamination includes the soil scoops or coring devices used to collect the samples and the bowls/buckets and spoons that may be used to contain or homogenize samples. Soil samples will be collected according to the procedures described in the SOPs for Soil Sampling and Replacement Material Sampling.

2.1 Equipment

The following is a list of equipment needed to decontaminate sampling equipment.

- Non-phosphate detergent such as Alconox
- Tap water – several gallons probably necessary
- Deionized water
- Chemical-free towels or paper towels
- Cleaning containers – plastic and/or galvanized steel pans or buckets
- Stiff cleaning brushes
- Aluminum foil, plastic wrap or plastic bags.
- Plastic bags for trash
- Powderless plastic gloves

2.2 Equipment Decontamination Procedures

1. Add the non-phosphate detergent to the appropriate amount of tap water in one of the clean plastic or stainless steel containers. Stir to mix.
2. Put on a pair of powderless plastic gloves.

3. Using the stiff brush, scrub all sampling equipment with the detergent/tap water solution. Scrub the equipment until all visible remnants of the sampled material are removed. During the decontamination process, do not lay any equipment being decontaminated on a surface other than a clean piece of plastic or aluminum foil.
4. Rinse each piece of equipment with clean tap water.
5. Rinse each piece of equipment with deionized water.
6. Place the cleaned equipment on clean aluminum foil or plastic wrap and allow to air dry or dry with clean chemical-free paper towels.
7. If not using the equipment immediately, place the clean dry equipment in plastic bags or wrap in aluminum foil for storage.
8. Contain and dispose of all decontamination water by pouring used solutions onto the ground surface at the sampling location.
9. Clean the container that had the detergent/tap water solution and the brush for future use.

2.3 Documentation

Field notes will describe the procedure used and the frequency of sampling equipment decontamination (this SOP may be referenced). Any procedure not in accordance with this SOP should be documented in the field notes.

STANDARD OPERATING PROCEDURE FOR SAMPLE HANDLING AND DOCUMENTATION

1.0 PURPOSE AND SCOPE

These procedures apply to sample handling and documentation performed for removal actions for Operable Unit No. 1, Off-Facility Soils, of the VB/I70 Superfund Site. Methods for soil, replacement material and water sample handling and documentation are provided.

2.0 SAMPLE HANDLING PROCEDURES

Soil, replacement material and water samples will be collected during property removal action activities. Samples will be collected according to the procedures described in the respective sampling SOPs.

2.1 Sample Identification

Each sample will be assigned a unique sample identification number. Each identification number assigned to an environmental sample will identify the property from which the sample was collected (if applicable), the sample matrix, the date of sample collection and sample sequence or depth (if applicable). Sample identification numbers will have several components, as explained using the following example:

VB/I70B138L101DC031029-1

The first character string, VB/I70, represents the site name. This is followed by the letter "B" and the block number for the property (138) and then the letter "L" and the lot number for the property (101). [Note: the block and lot numbers will only be used for flowerbed and garden samples because the remaining samples are not tied to a specific property] The next letters, DC, indicate the sample type (G = garden, F = flowerbed, DC = disposal characteristics, RT = replacement topsoil/garden soil, RS = replacement subsoil, RR = replacement road base, RG = replacement gravel, and EB = equipment blank). Following the sample matrix letter will be the sample collection date (year, month, day).

Additional information pertaining to the sample sequence may follow the date. For example, a "-1" or "-2" would indicate the sample sequence. A description of any additional information included in the sample identification number will be documented in the field records.

QC samples will follow the same convention. For example, an equipment blank may be

called VB/I70EB031029-1 to indicate it is the first (-1) equipment blank (EB).

2.2 Sample Containers and Preservation

Proper sample preparation practices will be observed to minimize sample contamination and avoid repeat analyses due to anomalous analytical results. Sample containers will either be commercially cleaned bottles or other appropriate sample containers provided by the analytical laboratory or, for soil samples, clean unused plastic bags. Bottles for samples that require preservation will either be pre-preserved by the laboratory or the preservative will be shipped separately for addition to the samples in the field. Sample preservation will be performed immediately upon collection to ensure that laboratory results are not compromised by improper preservation.

2.3 Sample Chain-of-Custody

After samples have been collected, they will be maintained under strict chain-of-custody procedures. The procedures described below will be used to document the transfer of custody of the environmental samples from the field to the designated analytical laboratory. The field sampling personnel will complete a Chain-of-Custody Record and Request for Analysis (CC/RA) form or similar form supplied by a laboratory for each shipping container (i.e., cooler or other container) of samples to be sent to each laboratory for analysis. The CC/RA for a shipping container will list only those samples in that shipping container. Information contained on the triplicate carbonless CC/RA form includes:

- Project identification;
- Date and time of sampling;
- Sample identification;
- Sample matrix type;
- Sample preservation methods (if any);
- Number and types of sample containers;
- Sample hazards (if any);
- Analysis type requested;
- Sample turn-around time;
- Method of shipment;
- Carrier/waybill number (if any);
- Signature of sampling personnel;
- Signature, name and company of person relinquishing and person receiving the samples when custody is being transferred;
- Date and time of sample custody transfer; and

- Condition of samples upon receipt by laboratory.

The sample collector will cross out any blank space on the CC/RA below the last sample number listed (on the part of the form where samples are listed). A sample label will be affixed to each sample container and filled out using indelible ink. Labels will be protected with a layer of clear tape. Each container will be carefully packaged in a shipping container (typically an ice chest) and shipped to the appropriate laboratory, as described below (Section 2.4).

The sampling personnel whose signature appears on the CC/RA is responsible for the custody of the sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting the sample to the designated laboratory. The sample is considered to be in custody when the sample is: (1) in the direct possession of the sample custodian; (2) in plain view of the sample custodian; or (3) is securely locked in a restricted access area by the sample custodian.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA under "Relinquished by" and "Received by." Signatures, printed names, company names, date and time are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain the third sheet (pink copy) of the CC/RA. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA. Copies, receipts or carbons of Bills of Lading will be retained as part of the permanent documentation in the project file. It is not necessary for courier personnel to sign the CC/RA. When the samples are received by the laboratory, the CC/RA will be immediately signed along with the date and time of receipt. The top sheet (white copy) of the CC/RA (or a copy of it) will be returned with the final analytical report.

2.4 Sample Shipping

All samples collected for laboratory analysis will be labeled and placed in an insulated cooler or other appropriate shipping container. If necessary for sample preservation, bags of ice will be placed around the samples to maintain a temperature of approximately 4°C. The ice in the cooler will be double-bagged. The coolers will be filled with packing material such as vermiculite or styrofoam to prevent sample breakage during shipment. The chain-of-custody forms (Section 2.3) will be placed in a sealed plastic bag and taped to the inside top of the cooler. The cooler will be taped shut and chain-of-custody seals will be attached to the outside of the cooler to ensure that the cooler cannot be opened without breaking the seal. Samples will be delivered or shipped via express delivery to the appropriate laboratory.

3.0 FIELD DOCUMENTATION

Documentation of observations and data acquired in the field provide information on sample acquisition, field conditions at the time of sampling, and a permanent record of field activities. Field observations and data collected during routine testing, monitoring, and sampling activities will be recorded with waterproof ink in a permanently bound weatherproof field log book with consecutively numbered pages or on field data sheets.

Field notebook and data sheet entries will include the information listed below, at a minimum. Additional information to be documented may be specified in the SOPs related to each type of sample collection.

- Project name
- Date and time of entries
- Data (i.e. field XRF measurements, soil descriptions)
- Sample identification numbers
- Date and time samples collected
- Sample location/description
- Comments and variances from the Work Plan/QAP
- Signature of field representative

MFG, INC. COC No. _____

Seattle Office
19203 36th Avenue W
Suite #101
Lynnwood, WA 98036
TEL: (425) 778-8252
FAX: (425) 771-8842

PROJECT NO.: _____ PROJECT NAME: _____ PAGE: _____ OF: _____
 SAMPLER (Signature): _____ PROJECT MANAGER: _____ DATE: _____
 METHOD OF SHIPMENT: _____ CARRIER/WAYBILL NO.: _____ DESTINATION: _____

[illegible]

FIGURE SOP-2-1. CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

APPENDIX G

CONSTRUCTION TECHNICAL SPECIFICATIONS

DRAFT-FOR GUIDANCE PURPOSES ONLY

**TECHNICAL SPECIFICATIONS WITH
CONSTRUCTION QUALITY CONTROL/QUALITY
ASSURANCE FOR
OPERABLE UNIT 1
VASQUEZ BOULEVARD/INTERSTATE 70
SUPERFUND SITE**

March 2003

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION VIII

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Specification Number	Description
01010	Summary of Work
01060	Regulatory Requirements
01300	Submittals
01505	Mobilization, Preparatory Work and Demobilization
01510	Temporary Facilities
01548	Preservation of Historical and Archeological Data
02020	Subsurface Conditions
02100	Site Clearing
02130	Surface Water and Sediment Control During Construction
02205	Yard Remediation Earthwork
02900	Vegetation Establishment – Trees and Shrubs
02920	Vegetation Establishment – Sod Installation

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section includes a general summary of the work to be performed under this Contract, as part of the non-time-critical removal action in the Residential Yard Operable Unit 1 of the Vasquez Boulevard/Interstate-70 (VB/I-70) Superfund Site in Denver, Colorado. The general work activities to be completed under this Contract include, but are not limited to: removal of contaminated soils from the residential yards, placement of backfill soils at removal areas, disposal of removed contaminated soils at approved facility or facilities, and vegetation establishment as necessary.

1.2 RELATED SECTIONS

- A. All Contract Documents

1.3 SCOPE OF WORK

- A. The project consists of residential yard remediations at the VB/I-70 Superfund Site in Denver, Colorado including:
 - 1. Prepare: a) a site-specific Health and Safety Plan (HASP) in accordance with specific requirements of 29 CFR 1910.120 and general requirements of 29 CFR 1910 and 1926; b) a Construction Contractors' Work Plan (CCWP) that provides a step-by-step description of the work to be performed, a construction quality control plan; a schedule of the construction activities; and c) a Construction Storm Water Management Plan.
 - 2. Mobilize and prepare for the Work including installation of all temporary facilities;
 - 3. Install temporary sediment, diversion and stormwater control structures at the work areas in accordance with the specifications and a Storm Water Management Plan, to be developed by the Contractor;
 - 4. Provide dust control, as necessary, during all excavating, hauling and placing operations;
 - 5. Excavate contaminated soils from residential yards along with all associated work;

6. Haul and dispose contaminated soils at USEPA-approved disposal facility or facilities in accordance with the approved Transportation and Disposal Plan;
7. Following removal of contaminated soils from the residential yards as directed, place backfill soil and regrade the areas to achieve pre-removal grades;
8. Place compacted soil and gravel in driveways or other gravel areas where removals were performed;
9. Perform temporary removal, replacement and repair/rehabilitation of existing fences, sheds, swing sets or other items as necessary following placement of backfill soils and replacement of all landscaping features in accordance with Site Remediation Plans;
10. Perform revegetation work at the residential yard removal areas as necessary including replacement of flowerbeds, sod installation, and watering;
11. Provide all necessary post-remediation documentation and perform site cleanup and demobilize.

1.4 ADDITIONAL REQUIREMENTS OF CONTRACTOR

- A. In the conduct of the construction work described above, Contractor shall:
 1. Comply with all applicable local, State and Federal health and safety rules and regulations; and
 2. Satisfy the requirements of the property owners to the extent practicable in restoring properties, and perform additional work as requested by, and at the expense of, property owners as needed.

END OF SECTION

SECTION 01060
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 CODES

- A. Contractor shall comply with the most recent edition of all codes and regulations of applicable regulatory authorities, including:
1. Applicable U.S. Environmental Protection Agency regulations and other Federal regulations pertaining to solid and hazardous wastes and air quality (40 CFR Parts 50, 107, 171-177, 260-264, and 257);
 2. Colorado Department of Public Health and Environment (CDPHE) regulations including air emission control (5CCR 1001) and solid and hazardous waste regulations (6CCR 260-264 and 1007);
 3. Applicable Occupational Safety and Health Administration (OSHA) Regulations (29 CFR Parts 1910 and 1926);
 4. Applicable City and County of Denver Regulations for construction and transportation;
 5. Applicable State of Colorado Department of Transportation and Federal Department of Transportation Regulations;
 6. National Pollutant Discharge Elimination System (NPDES) requirements of the Federal Clean Water Act for storm water discharges and the Colorado Water Quality Control Act requirements for storm water discharges associated with construction activity.
 7. Applicable Denver Regional Urban Storm Drainage Guidelines for construction activities;
 8. Federal and State Historic and Archeological Resources and Data Preservation Acts,
 9. State of Colorado Noise Abatement Statute (C.R.S., Section 25-12-103);
 10. National and Local Electrical and Fire Protection Codes; and
 11. Colorado Undesirable Plant Management Act (C.R.S., Section 35, Article 5.5).

- B. In the event of conflicts between the requirements of various codes and regulations, Contractor shall comply with the more stringent code or regulation.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section describes the requirements for all submittals associated with and required by the Project. The submittals include a brief Construction Work Plan, a construction Storm Water Management Plan, Health and Safety Plan, construction progress schedules, material certifications, samples and test specimens.

1.2 RELATED SECTIONS

- A. All Sections

1.3 GENERAL SUBMITTAL REQUIREMENTS

- A. Transmit each submittal to the Supervising Contractor who will review each submittal and return to contractor with resubmittal requirements or approvals within 20 working days. Submit the number that the Contractor requires, plus two copies to be retained by the Supervising Contractor.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Each submittal shall include a statement certifying that review, verification of products required, field dimensions, procedures and coordination of information, is in accordance with the requirements of the Contract Documents.

1.4 CONTRACTOR'S CONSTRUCTION WORK PLAN

- A. Within 15 days after receipt of Notice of Award and prior to beginning work, Contractor shall submit a CCWP that will contain the following:
 - 1. Plans for Mobilization, Preparatory Work and Demobilization as described in Section 01505.
 - 2. A construction quality control plan detailing the contractor's proposed QC tests, surveys and other procedures required for the work prepared in accordance with the Construction Quality Assurance Plan.
 - 3. Plans for soil excavation, and disposal, and clean soil backfill as described in Section 02205.
 - 4. A detailed construction schedule for the residential yard remediation work in electronic format and hard copy.

1.5 CONSTRUCTION STORM WATER MANAGEMENT PLAN

- A. Within 15 days after receipt of Notice of Award and prior to beginning work, Contractor shall submit a CSWMP that will contain the following:
 - 1. A description of Storm Water and Erosion Pollution Prevention Best Management Practices (BMPs) that will be implemented during construction.
 - 2. Materials handling, spill prevention, inspection and maintenance procedures and other site controls.
 - 3. All other information required by the NPDES and Colorado regulations for construction storm-water pollution prevention.

1.6 HEALTH AND SAFETY PLAN

- A. Within 30 working days prior to commencing the work, Contractor shall submit a site Health and Safety Plan (HASP) that includes a construction safety program. The HASP shall be in accordance with provisions in 29 CFR 1910.120; other federal, state, and local regulations; and Contractor guidelines. The HASP shall be submitted and reviewed by the Supervising Contractor prior to the start of the job. Also, as part of the contractor safety program, the Contractor shall establish the procedure for the immediate removal to a hospital or doctor's care of any person who may be injured on the job site. Contractor shall submit First Aid and/or EMT certifications for a minimum of one person per field crew.
- B. The HASP shall include identification of an air monitoring program for worker protection, equipment decontamination, and other items required by 29 CFR 1910-120. Disposal of personal protection equipment, and potentially contaminated soils and water shall be included and the cost for disposal of these items shall be included in the bid.
- C. The duty of the Supervising Contractor to conduct construction review of the Contractor's performance is not intended to include a review or acceptance of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.
- D. All workers working with arsenic- and lead- contaminated materials must comply with the training requirements of OSHA 1910.120. Workers engaged in property restoration following removal of the arsenic- and lead- contaminated material are not required to have OSHA 1910.120 training.

1.7 DOCUMENTATION OF PRE-CONSTRUCTION CONDITION OF PROPERTIES

- A. Contractor shall thoroughly document pre-remediation conditions at each property to be remediated by means of a checklist together with supporting documentation such as VHS video recordings and/or 35 mm photographs. This checklist shall

include the condition of the ground cover, grading, vegetation, erosion control, paving, sidewalks, existing sprinkler systems, fences, buildings, or other improvements. For sprinkler systems that are being replaced, the pre-remediation checklist should provide, to the extent feasible, sufficient information to document the quality and condition of the existing materials. The pre-remediation checklist shall note any planned changes between pre- and post-remediation conditions. Contractor shall complete the checklist of pre-remediation conditions for each property to be remediated and perform post construction documentation using similar procedures. The documentation shall be provided to the Supervising Contractor within one week of completing each pre- and post- construction inspection.

1.8 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule along with the CCWP within ten (10) days after Notice of Award. The schedule shall be shown in weekly increments at a minimum.
- B. Submit revised schedules as appropriate.
- C. Show complete sequence of construction by activity identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration. Schedule shall provide for winter shutdown periods, as necessary.
- D. Provide a summary of remediation progress at the end of each construction season and submit to Supervising Contractor along with the annual summary report.

END OF SECTION

SECTION 01505
MOBILIZATION, PREPARATORY WORK AND DEMOBILIZATION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification covers the requirements for mobilization, preparatory work, temporary facilities, and demobilization. Temporary diversion and sediment control facilities are specified in Section 02130.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 01510 - Temporary Construction Utilities and Facilities
- C. Section 02100 - Site Clearing
- D. Section 02130 - Surface-Water and Erosion Control During Construction
- E. Section 02205 - Yard Remediation Earthwork
- F. Transportation and Disposal Plan - attached

1.3 SUBMITTALS

- A. As noted in Section 01300 1.4A, within 10 days after receipt of Notice to Proceed, Contractor shall submit a Construction Contractor's Work Plan (CCWP). The CCWP will include appropriate drawings, identifying all proposed preparatory work including, as applicable, site access and traffic control; truck wheel cleaning methods; construction plan layout; temporary offices and other structures; storage buildings and yards; temporary water supply and distribution; temporary power supply and distribution; re-contamination prevention procedures; and temporary sanitary and personnel decontamination facilities.

PART 2 PRODUCTS AND EQUIPMENT

- A. Contractor shall utilize appropriate and sufficient products and equipment in the conduct of all preparatory work and the establishment of all temporary facilities, consistent with the nature and requirements of the project and the health and safety of workers and the public.
- B. Use water trucks and/or approved dust suppressants on haul roads and in work areas, as necessary during hauling operations.
- C. Haul trucks and equipment shall be properly maintained to avoid excessive noise during hauling operations within Denver.

- D. Use appropriate "Truck Crossing" or "Trucks Turning" signs on public roads, where required at work areas, and use appropriate signage and traffic cones where required on public roads.
- E. Use a truck wheel cleaning area if necessary at the disposal site to minimize spreading of contamination.

PART 3 EXECUTION

3.1 MOBILIZATION

- A. Following receipt of the Notice of Award and approval of all pre-construction submittals, Contractor shall mobilize to the Site all labor, materials, equipment, and construction facilities necessary for the proper performance of the Work.

3.2 INSTALLATION OF FACILITIES

- A. All preparatory work and installation of temporary facilities shall be done in accordance with applicable codes and regulations and shall utilize available locations as approved by the Supervising Contractor.
- B. Because of the areal extent of the residential yard remediation work, various set-up locations for equipment may be required depending upon work location. Contractor shall plan accordingly and obtain all necessary approvals required.

3.3 WORK AREA SECURITY AND TRAFFIC CONTROL

- A. Contractor shall provide caution tape, temporary fencing, gates, and signs, as necessary, to limit public access to the work area and shall be responsible for the safety of all individuals on the work area.
- B. Contractor shall conduct its operations so as not to significantly interfere with the normal flow of traffic on local roads near the work area. Where required by City/County of Denver or State of Colorado regulations, flag persons and signage shall be provided to ensure public safety.
- C. Haul trucks at the Site, traveling on public roads, shall be limited to speeds of 25 mph in residential areas, and shall comply with all posted speed limits in Denver and adjacent counties/municipalities through which waste materials are hauled.
- D. Haul trucks and equipment shall comply with the requirements of the Colorado Noise Abatement Statute, as follows:
 - 1. Applicable activities shall be conducted in a manner so any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Noise is defined to be a public nuisance if sound levels radiating from a property line at a distance of twenty-five feet or more

exceed the sound levels established for the following time periods and zones:

Zone	7:00 am to Next 7:00 pm	7:00 pm to Next 7:00 am
Residential	55 db (A)	50 db (A)
Commercial	60 db (A)	55 db (A)
Light Industrial	70 db (A)	65 db (A)
Industrial	80 db (A)	75 db (A)

2. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in Requirement a (above) may be increased by ten decibels for a period of not to exceed fifteen minutes in any one-hour period.
3. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five decibels less than those listed in Requirement a (above).
4. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.
5. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

- E. Comply with all requirements of the Transportation and Disposal Plan.

3.4 MAINTENANCE AND PROTECTION OF EXISTING DRAINAGE

- A. Contractor shall take all necessary precautions to limit disturbance to natural drainageways in the vicinity of the Work, and shall install temporary culverts and other drainage works, as required, to maintain drainageways during construction.
- B. Contractor shall control erosion along access roads and provide sedimentation control structures downstream of temporary access roads, and all Work areas to prevent discharge of sediment to the Denver storm drainage system, as specified in Section 02130.

3.5 ACCESS AND HAUL ROADS

- A. Contractor shall properly maintain all access and haul roads necessary for the conduct of the Work. Remove all spilled or tracked waste materials from the public roads immediately, and clean public roads as necessary at the completion

of hauling. Contractor shall repair any damage to permanent roads, curbs/gutters, sidewalks, and bridges and restore them to a condition equal to or better than that found at the outset of the project, and in accordance with city specifications.

- B. Contractor shall comply with all posted load limits for local roads and bridges used in transporting materials.
- C. Contractor shall apply water and/or approved dust suppressants to access roads between the work areas, if necessary.
- D. Comply with access requirements of Asarco, if disposal at the Globe Plant is performed, or with operators of a municipal solid waste disposal landfill, as applicable.

3.6 WORK AREA MAINTENANCE

- A. Contractor shall keep work areas free from any unnecessary accumulation of waste materials and rubbish and shall maintain the work areas in a safe and tidy condition at all times
- B. Contractor shall prevent leaks from all equipment and haul trucks and shall clean up any releases should they occur.

3.7 TEMPORARY WINTER SHUTDOWN

- A. Contractor shall provide for temporary winter shutdown of the construction as necessary by completing components of the work prior to shutdown, and performing any other work necessary to provide for a safe and orderly temporary shutdown period and subsequent spring start-up.

3.8 CLEANUP AND DEMOBILIZATION

- A. Following completion of the Work, Contractor shall thoroughly clean all equipment that has come into contact with contaminated material, and remove from the site all equipment, materials and temporary facilities not incorporated into the Work.
- B. Remove temporary culverts if any, at the end of the construction, and restore areas, as directed.
- C. Maintain the sedimentation control features as necessary during construction. If directed by the Supervising Contractor, leave sediment controls in-place at the end of construction to provide sediment control during the vegetation establishment period, otherwise, remove all temporary sediment/erosion control devices at the completion of remediation in an area or yard.

- D. Waste materials, debris and rubbish generated by the Contractor shall be properly collected and disposed of offsite, in accordance with local, state, and federal laws and regulations.
- E. Contractor shall leave all areas of the Site, including all remediated properties, in a clean, stable condition.

END OF SECTION

SECTION 01510
TEMPORARY CONSTRUCTION UTILITIES AND FACILITIES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section describes the requirements for temporary construction utilities and facilities required by the Project. These include but are not limited to water service, electric power, telephone service, sanitary facilities and office space.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 01505 – Mobilization, Preparatory Work and Demobilization
- C. Section 02900 – Vegetation Establishment – Trees and Shrubs
- D. Section 02920 – Vegetation Establishment – Sod Installation

1.3 SUBMITTALS

- A. Within 10 days after receipt of Notice of Award, Contractor shall submit a written final CCWP. The CCWP, mentioned in Section 01505 - 1.4A and elsewhere, will include appropriate drawings, identifying all proposed preparatory work including, as applicable, temporary offices and other structures; storage buildings and yards; temporary water supply and distribution; temporary power supply and distribution; and temporary sanitary and personnel decon facilities.

PART 2 PRODUCTS

2.1 TEMPORARY WATER

- A. Provide potable water for contractor's workers at the Site. Contractor may be able to arrange domestic water service with Denver Water.
- B. Water for dust control, moisture control for compaction and watering of replacement vegetation will be acquired as necessary by contractor, and shall be used in accordance with any special-use permits for the project as acquired from Denver Water by USEPA.
- C. Temporary water line installation(s), if necessary, shall meet the requirements of all governing agencies.

2.2 TEMPORARY ELECTRIC POWER

- A. Temporary electric service shall be established by the Contractor.
- B. Temporary electric power installation shall meet the requirements of all applicable codes and regulatory agencies.

2.3 TEMPORARY TELEPHONE SERVICE

- A. Temporary phone service shall be established by the Contractor. A minimum of two lines will be required with one line each for the Contractor and Supervising Contractor. Installation shall meet the requirements of all applicable codes and regulatory agencies.
- B. Contractor shall provide for two-way radio and cellular phone service necessary to maintain continual contact between site crews/haul trucks and the Construction Office and Construction Superintendent.

2.4 SANITARY FACILITIES

- A. Contractor shall provide temporary sanitary facilities at the Site, as required, for all work crews, Supervising Contractor, and visitors.

2.5 OFFICE/TESTING TRAILER

- A. Contractor shall provide for an office space of at least 12' by 20' for use by the Supervising Contractor, plus space required for Contractor's use. Office trailer(s) shall be equipped with heating, air conditioning, electrical supply, and telephone service.
- B. Contractor shall provide a separate trailer for QA/QC testing and storage of testing equipment.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY

- A. Schedule delivery of products or equipment as required to allow timely installation and to avoid excessive on-site storage. No inside storage is available unless provided by Contractor. Contractor should provide for suitable storage of equipment and materials and arrange for storage/staging and construction personnel, visitor and Supervising Contractor parking.
- B. Delivery of products or equipment to be in manufacturer's original unbroken cartons or other containers, clearly and fully marked and identified as to manufacturer, item, location where to install, and instructions for assembly, use and storage.

- C. The Contractor shall inspect all products or equipment delivered to the site prior to their unloading and shall reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on project.

3.2 STORAGE AND HANDLING

- A. Store products or equipment off ground and protected from weather. Provide additional protection as required by manufacturer until the time that the item is to be installed. While storing, take care to avoid damage from water or humidity.
- B. Store products or equipment in location to avoid physical damage to items while in storage, and to facilitate prompt inspection.
- C. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
- D. Delicate instruments and materials subject to vandalism or theft shall be placed under locked cover and, if necessary, provided with temperature control as recommended by manufacturer.
- E. Spill control measures shall be implemented as necessary.

END OF SECTION

SECTION 01548
PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL DATA

[Note: this section may be deleted, depending on the ARARs identified in USEPA's Record of Decisions]

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 02205 – Earthwork for Yard Remediation

1.2 LEGISLATION

- A. Federal legislation (Public Law 93-291); National Historic Preservation Act; The Archeological Resources Protection Act of 1979; and Historic/Archeological Data Preservation Act of 1974 provides for the protection, preservation, and collection of scientific, prehistoric, historic, and archaeological data (including relics and specimens) that might otherwise be lost due to alteration of the terrain as a result of any construction project.

1.3 CHANGES TO THE CONTRACT TIME AND/OR PRICE

- A. Where appropriate, by reason of an historic or archaeological discovery, the Supervising Contractor or USEPA may order delays or alterations in the Project Schedule, or changes in the Work, or both. Where such delays, alterations or changes are ordered, the USEPA may adjust the time of performances and/or the Contract Price in accordance with the applicable clauses of this Contract.

PART 2 PRODUCTS

2.1 MATERIALS

- A. The Contractor shall use appropriate and sufficient materials to preserve historical and archaeological data, as required, or as directed by the USEPA.

PART 3 EXECUTION

3.1 COMPLIANCE

- A. If the Contractor, Contractor's employees and/or subcontractors, in the performance of this Work, discover evidence of possible scientific, prehistoric, historic, or archaeological data, the USEPA or its Representative shall be notified immediately of the location and nature of the findings, and written confirmation shall be forwarded within two days. Contractor shall exercise care so as not to damage artifacts, fossils or other evidence uncovered during construction

operations. Contractor shall provide such cooperation and assistance as may be necessary to reserve the findings for removal or other disposition by the USEPA. Title to materials found on the site will reside with the USEPA or landowner.

- B. Contractor agrees to insert Paragraph 3.1 A in all subcontracts which involve the performance of Work on the Site.

END OF SECTION

SECTION 02020
SUBSURFACE CONDITIONS

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 02130 – Surface-Water and Sediment Control During Construction
- B. Section 02205 – Yard Remediation Earthwork

1.2 DATA

- A. Very limited general subsurface data have been compiled for the project site and include only shallow soil sampling at various properties. These data will be provided at Contractor's request and represent best available information only; the Contractor shall satisfy itself as to the value of this information and obtain additional information if it deems necessary. USEPA and the Supervising Contractor make no warranty as to the quality or completeness of this information.

1.3 QUALITY CONTROL

- A. Make no deviations from the Contract without specific and written approval of the USEPA or its Representative.
- B. Obtain approval from the Supervising Contractor before performing any exploratory excavations or borings.
- C. Contractor shall verify the location of all underground utilities and other permanent features prior to excavating at a property.

END OF SECTION

SECTION 02100
SITE CLEARING

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers the requirements for removal of existing surface debris and clearing of designated vegetation in preparation for yard remediation.

1.2 RELATED SECTIONS

- A. Section 02205 – Yard Remediation Earthwork

1.3 REGULATORY REQUIREMENTS

- A. Contractor shall comply with the requirements of all applicable Local, State, or Federal codes regarding clearing and disposal of related debris.

PART 2 PRODUCTS AND EQUIPMENT

- A. Contractor shall use appropriate and sufficient products and equipment in the conduct of all site clearing work.

PART 3 EXECUTION

3.1 PREPARATION

- A. Contractor shall verify the extent of clearing necessary for the conduct of the Work and shall ensure that existing plant life and features designated by the Supervising Contractor or property owner to remain are clearly tagged or otherwise identified.

3.2 PROTECTION

- A. Contractor shall take all necessary precautions to ensure that existing facilities and structures, designated vegetation, and survey control points are protected against damage or displacement. Contractor shall repair or replace damaged survey control points and other site features designated to remain as required by state law and at its own expense.

3.3 PERMITS

- A. Contractor shall obtain all necessary permits and pay any applicable fees for removal and/or disposal of cleared materials.

3.4 CLEARING AND GRUBBING

- A. Contractor shall clear only those areas required for access to site and execution of Work, and shall minimize disturbance to adjacent land and large, healthy trees and bushes, subject to the approval of USEPA.
- B. Remove dead trees and shrubs and small trees (less than 2-inch diameter) and bushes from areas with consent of the property owner and dispose of such materials as required.
- C. Stumps and root systems shall be removed to a depth of 12 inches below the existing surface where required.

END OF SECTION

SECTION 02130
SURFACE WATER AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification section covers the requirements for controlling surface water drainage and sediment during yard remediation work.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals
- B. Section 01505 - Mobilization, Preparatory Work and Demobilization
- C. Section 02205 - Yard Remediation Earthwork

1.3 QUALITY CONTROL

- A. Contractor shall be fully responsible for complying with all provisions of the applicable Colorado storm water control regulations of the Colorado Water Quality Control Act including construction-related storm-water discharges and the NPDES requirements for construction-related storm-water discharges.

1.4 SUBMITTALS

- A. A Storm Water Management Plan shall be included with the Contractor's initial submittals which shall include information on materials and methods proposed for drainage and sediment control measures at the site as specified in Section 01300, Part 1.5 and in accordance with the applicable State and Federal regulatory requirements.

PART 2 EQUIPMENT AND PRODUCTS

2.1 EQUIPMENT

- A. Contractor shall ensure that sufficient sediment-control Best Management Practices (BMPs) and other appropriate equipment and materials are available on site, prior to commencement of work, such that operation of the surface water and sediment control systems can be continuously maintained. All equipment shall be of good quality and in good working order.

2.2 MATERIALS

- A. Straw bales, silt fences, filters, sediment traps/basins or other materials used to control erosion and sediment transport from excavations and other work areas shall be new and appropriately sized to serve the intended purpose.
- B. Use certified weed-free straw bales, as necessary.
- C. Use 30- to 36-inch high silt fences including slats for stability, as necessary.

PART 3 EXECUTION

3.1 STORM WATER AND SEDIMENT CONTROLS

- A. Provide sedimentation control BMPs in the Work areas as required, and as directed, to prevent inflow of sediment to Denver's storm sewer system and to prevent sediment loading to adjacent streams and adjacent properties. Install straw bale, sod filter strips, silt fence sediment barriers or other BMPs as required in the work areas as directed.
- B. If required, install silt fences with suitable posts and proper anchorage along the entire length of the silt fence, with support stake spacing and burial of geotextile in accordance with the manufacturer's recommendations.
- C. Remove and dewater silt or sediment buildup behind silt fences and sedimentation control dams as necessary during construction and near the end of the work, prior to shutdown, and dispose of sediments as with excavated soil.
- D. Construct small sedimentation traps at the discharge of the diversion lines, if necessary and as directed.
- E. If necessary, maintain the diversion pipes or systems and sediment control structures as applicable throughout the performance the work, as necessary. Remove sediments in sedimentation ponds or collection structures as necessary during construction.
- F. Provide all necessary vehicle tracking controls to minimize tracking of sediment or mud onto public roadways, sidewalks or alleys.

3.2 VEHICLE TRACKING CONTROLS

- A. Provide all necessary vehicle tracking controls to minimize tracking of sediment or mud onto public roadways, sidewalks or alleys.
- B. Wherever construction vehicles enter onto paved public roads, provisions must be made to prevent the transport of sediment (mud and dirt) by runoff or by vehicles tracking onto the paved surface. For sites greater than two (2) acres, a stabilized vehicle tracking control must be constructed. Whenever deemed

necessary by the City/County of Denver, and as approved by Denver Water, wash racks shall be installed to remove mud and dirt from the vehicle and its tires before it enters onto public roads.

- C. Whenever sediment is transported onto a public road, regardless of the size of the work area, the road shall be cleaned at the end of each day. Sediment shall be removed from roads by shoveling or sweeping and be transported to a controlled sediment disposal area. Street washing shall not be allowed until after sediment is removed in this manner and only if authorized by Denver Water. If washing is not permitted, the streets shall be cleaned by a street sweeper truck. Storm sewer inlet protective measures should be in place at the time of street washing.

3.3 DEWATERING METHODS – IF NEEDED

- A. Contractor shall perform dewatering, as necessary, during all construction at the site, such that water levels are maintained below the bottom of excavations.
- B. Contractor shall select methods of dewatering and arrangement of related piping systems that minimize direct discharges to adjacent streets and storm drains, and do not cause erosion or instability of the work site or adjacent areas.

END OF SECTION

SECTION 02205
YARD REMEDIATION EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers the construction procedures necessary to remove soil and remediate specified residential properties and adjacent areas, including road aprons, as necessary.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 021300 – Surface Water and Sediment Control during Construction
- C. Section 02900 – Vegetation Establishment – Trees and Shrubs
- D. Section 02920 – Vegetation Establishment - Sod Installation
- E. Transportation and Disposal Plan - Attached
- F. Summary of Construction Quality/Quality Assurance Monitoring and Testing, Table 3-1 of Construction Quality Assurance Plan – Attached
- G. Replacement Soil Composition Requirements, Table 2-1 of Removal Action Work Plan - Attached

1.3 SAFETY

- A. Contractor shall comply with the applicable safety and health requirements of OSHA.
- B. Contractor shall exercise particular caution during excavation, handling and placement of soils, which may exhibit elevated concentrations of arsenic and lead and could present a potential health hazard to Contractor's site personnel, if not properly protected.
- C. Comply with the requirements of the Contractor's Health and Safety Plan for Construction Activities.
- D. Provide visual safety barriers (e.g., caution tape, safety fence, etc.) around work sites.
- E. Provide all other safety requirements stipulated in the Transportation and Disposal Plan.

1.4 QUALITY CONTROL

- A. Contractor shall use adequately experienced personnel in performing yard remediation earthwork.
- B. Perform quality control tests using the methods and at the frequencies identified in Table 3-1 of the Construction Quality Assurance Plan.
- C. Supervising Contractor will perform periodic quality assurance monitoring sampling and observations. Provide assistance and cooperation as needed for QA.

PART 2 PRODUCTS

2.1 RESIDENTIAL YARD REPLACEMENT SOIL

- A. Use locally available, approved native backfill material for soil replacement as required. Soil shall meet the project composition requirements (clay, silt, and sand content) for replacement soil.
- B. Constituent concentrations shall not exceed limits specified in Table 2-1 of the Removal Design Work Plan.
- C. Contractor shall identify borrow source(s) for residential yard replacement soil. Borrow sources shall be approved by Supervising Contractor before materials are transported to the Site.

2.2 GRAVEL MATERIALS

- A. For gravel surfacing use a cover coat aggregate consisting of crushed stone, crushed or natural gravel, Type IV, as specified in CDOT Standard specifications for Road and Bridge Construction.
- B. Contractor shall identify borrow sources for base course and gravel. Borrow sources shall be approved by USEPA before materials are transported to the Site.
- C. Constituent concentrations shall not exceed limits specified in Table 2-1 of the Removal Design Work Plan.

2.3 ORGANIC AMENDMENTS

- A. If required, soils shall be amended using humus compost, dried and pulverized poultry manure, or aged treated and pulverized manure. Apply at a maximum rate of 3 cubic yards per 1,000 square feet of topsoil.

2.4 MISCELLANEOUS YARD REPLACEMENT MATERIALS

- A. If miscellaneous yard replacement materials are required such as fencing sprinkler heads, paving stepping stones or other items, provide materials of the same type and equal or better quality to the materials removed or damaged during yard remediations.

PART 3 EXECUTION

3.1 AREAS OF REMOVAL

- A. Site plans identifying specific details of remediation will be provided by the Supervising Contractor, which Contractor shall utilize for its soil removal and replacement operations. In general, the following areas will typically be excavated: sod, open yard and landscaped areas to asphalt or pavement and to lateral extension of property lines; gardens and flowerbeds; unpaved driveways; areas under temporary structures (such as storage sheds, landscape timbers, stepping stones, etc.), road aprons (strips between sidewalks and streets), and beneath decks higher than 18 inches above ground level.
- B. Excavation is not required in areas that are paved or otherwise covered (such as concrete pads, patios, sidewalks, paths, driveways, and crawl spaces), or in areas where permanent structures are present (such as houses, garages, and wooden decks lower than 18 inches). Larger trees and shrubs shall be left in place.

3.2 PREPARATION

- A. Yard preparation will commence with final notification to the property owners of the intended action, date, and start time. This notification will be made by the Supervising Contractor at least one week prior to the start of remediation. Contractor shall immediately notify Supervising Contractor of any anticipated delays that may result in work not being performed on the notified start date.
- B. Immediately prior to beginning work, a Site inspection will be arranged by the removal action contractor with the local utility companies to locate electrical, water, sewer, gas, cable, television, and phone lines. Affected residents will be notified of this Site inspection and asked to participate, if needed, to provide information on subsurface obstacles such as septic systems and abandoned lines. The utility company will be requested to mark these utilities on the ground

with colored spray paint. The removal action contractor shall inspect each yard for visible obstacles, and may utilize an electromagnetic detector if there is reason to suspect buried obstructions have not been marked. Locations of subsurface obstacles shall be confirmed by hand digging to locate and uncover the obstacle. The type and location of the obstacle shall be placed on a site plan of the residential property, which shall be issued to the work crew prior to remediation startup.

- C. Surface obstacles to be removed prior to remediation actions shall be identified by the Supervising Contractor in consultation with the Contractor. The property owners will be asked to discuss any concerns or special requests they may have in removing surface obstacles or in preparing their yard for remediation. Supervising Contractor shall request that the property owners remove and store personal possessions and keepsakes requiring special care inside their buildings. Woodpiles, walkway stepping stones, and other miscellaneous landscape articles shall be relocated on-site by contractor, if possible. Large obstructions such as fences and gates shall be removed by contractor if necessary and stored onsite to allow for ingress of equipment and access for the work crews.
- D. Permanent fixtures, other building structures connected to, or separate from, primary buildings, and footings near buildings will be marked, photographed and/or videotaped and identified as to their condition by Contractor. Detailed photo and video documentation shall be performed by the Contractor to identify and record the existing conditions of the property prior to remediation. The Supervising Contractor will provide a checklist of the minimum photo documentation requirements. The Construction Contractor will provide the required photo documentation to the Supervising Contractor prior to beginning property remediation.
- E. Large possessions, such as RVs, boats, or vehicles, will be relocated by the property owner. In special cases, where the property owner is physically unable, the Contractor shall assist them with the transport of possessions. Shields for subsurface pipelines left in place or support members to retaining walls and siding shall be installed prior to the start of excavation activities as required.

3.3 DUST SUPPRESSION

- A. Dust suppression water mist sprays shall be used to minimize the potential for fugitive dust emissions if authorized by Denver Water. Application rates shall be regulated to control dust during excavation without contributing to the development of mud. The objective is to minimize airborne dust and, at the same time, minimize production of mud which could be transported off-site on haul trucks and other mobile equipment. Dust suppression equipment will consist of standard garden hoses and spray regulators connected to a tanker truck or trailer. All equipment shall be provided by Contractor.
- B. The Contractor shall provide the following water applications during the course of remediation operations and on an as-needed basis:

- During soil removal operations by heavy equipment and by hand crews;
 - At work intervals where wind and/or dry weather require such actions to prevent airborne emissions; and
 - During stockpiling and loading of soils into staging areas before off-site transportation.
- C. Work area shall be broomed to remove any spilled soils and may be washed down if authorized by Denver Water. After washing down sidewalks, streets, alleys and other paved areas, accumulated soil materials shall be collected and transported along with the removed soils to disposal area(s). Excavated soils shall be removed from the residential areas at the earliest opportunity. If these soils cannot be removed by the end of daily work, they shall be covered with tarpaulins. Under no circumstances shall any soils be allowed to wash into storm drains or drainage ditches.

3.4 EXCAVATION

- A. Contractor shall perform surveying or provide an alternate means acceptable to Supervising Contractor to verify the adequate removal of the specified depth of soil. Contractor shall provide survey data, inspection reports or other appropriate records to the Supervising Contractor to document removal as specified.
- B. Soil shall be removed to the specified depth (12 inches) minimum in open areas throughout the yard and from below portable sheds that may be moved without damaging the shed. Soil shall be removed to a depth of 4 inches below the deck located 18 inches or greater above ground. Soil shall not be removed below decks lower than 18 inches. During excavation, take care to hand excavate next to buildings, sidewalks, and other structures to maintain support and prevent damage. When necessitated by extremely unstable conditions, soil shall be sloped slightly away from the edges of sidewalks, rock structures, or weak concrete foundations or other supporting structures to prevent loss of support and potential weakening of these features.
- C. Where utilities will be encountered at depths within the scope of excavation, soil around these utilities shall be hand excavated. Where interruptions to any services occur as a result of removal activities, utility companies shall be contacted as soon as possible, and no later than ½ hour from initial interruption.
- D. Excavation around shrubs and tree roots shall be performed by hand and equipment, and removed and disposed with other debris. Excavations shall be tapered around trees from the trunk to the drip zone to avoid damage to roots.
- E. Sprinkler systems encountered shall be either excavated by hand or removed and disposed with other debris. Generally the sprinkler heads shall be removed and saved along with major components such as manifolds, valves and

controllers. The pipes shall be removed and disposed. Upon backfill the pipes shall be replaced and the components re-installed.

- F. Fences shall be removed (if required), salvaged, and replaced upon completion of backfill. Where feasible to leave in place during excavation, hand work around posts etc. shall be performed to maintain fence stability and prevent damage.

3.5 EQUIPMENT OPERATIONS

- A. Ingress areas for equipment travel shall be secured, and adequate materials shall be placed on sidewalks or other heavy traffic areas to protect them from damage during excavation work. Travel over sidewalks shall be limited to the extent practicable.
- B. Work crews shall not utilize procedures which result in damage to buildings and structures. Spotters shall communicate the zones of heavy equipment operations to hand crews at all times. Hand signals and communication plans for equipment operators and work crews shall be developed and used.
- C. Excavated materials shall be loaded into haul trucks at or near excavation areas. If it is not possible to back haul trucks onto the site, adjacent to the excavation areas, an intermediate soil stockpile may be required prior to loading trucks. Stage such material hauling to avoid contamination of adjacent areas.

3.6 PROTECTION OF STRUCTURES AND PLANTS

- A. Hand excavation is required for all areas susceptible to potential damage from equipment operations. Areas of concern include structures (i.e., houses, garages, sheds, paved driveways and sidewalks, septic systems), as well as any other areas that would require hand excavation as identified on the site plan determined by Supervising Contractor and the property owner. The Contractor shall inspect structures and large tree roots during excavation operations and take immediate and appropriate steps if either are damaged.
- B. Based on the site plan, and photos from the access agreements, structures and buildings shall be inspected for evidence of deformation or changes resulting from remediation activities. The removal action contractor shall contact the Supervising Contractor and homeowners when conditions are discovered that warrant such notifications.
- C. Care shall be taken to not interfere with overhead utility lines in the work areas. Provide safeguards as necessary to protect such overhead lines.

3.7 TEMPORARY WORK STOPPAGES AND WINTER SHUTDOWN

- A. If conditions are encountered which are beyond the control of the removal action contractor that delay or prevent the performance of the remediation, the removal action contractor shall stop work and immediately inform the Supervising

Contractor and the property owner. These conditions include: uncovering of artesian wells or other subsurface flow phenomena, building or structural impairments and, unknown utilities or subsurface features such as abandoned septic systems.

- B. Plan yard remediation work accordingly for winter shutdown periods. No yard remediation earth work or property restoration shall be left partially completed at any property during winter shutdown periods, including sodding.

3.8 ACCESS FOR PROPERTY OWNER

- A. Clear and clean access shall be provided to residents at all times during remediation activities such that residents will not have to walk through soil prior to entering their homes. Sidewalks shall be thoroughly brushed and washed off with water (if authorized) after each work day to provide as clean an entry as possible to the residence. If there is no sidewalk to the residence, a clean pathway shall be provided to the resident by laying down plywood, pallets, plastic, or using some other means to prevent exposure and tracking of soil containing contaminants.

3.9 DECONTAMINATION PROCEDURES

- A. Equipment and tools used in the remediation process shall be decontaminated prior to leaving the work area. Decontamination shall first involve a brush down of remediation equipment in the yard to remove visible accumulation from machinery, tires, shovels, etc. Use of water shall be avoided whenever possible. Water shall be used if visible contamination is evident after dry brushing, prior to leaving the site for any reason. In these cases, equipment shall be washed while on the premises to minimize the migration of mud and water to the streets. Soil removal during equipment decontamination shall be contained, removed and transported to the disposal area(s).
- B. Workers are required to decontaminate daily, or whenever leaving a site where soil removal activities are being performed. Decontamination protocols shall be included in the Contractor's Health and Safety Plan and instituted by the Contractor. Streets, rights-of-way and access routes shall be cleaned of noticeable accumulations of soil, dust, or debris that are attributable to yard remediation activities.

3.10 SOIL DISPOSAL

- A. Disposal of removed soil, wash down materials and other debris shall be at an USEPA-approved municipal solid waste (MSW) landfill facility or facilities, or the Asarco Globe Plant. No materials shall be transported to a disposal site without prior approval to USEPA.
- B. Excavated soil and debris shall be transported to the disposed facility in covered trucks. Access to the disposed area(s) will involve transport on public roads or possible limited constructed temporary haul routes. Soil-transport operations

shall be limited to daylight hours and shall be performed in a safe and controlled manner. Loads shall be kept below the upper edges of the truck bed and shall be covered prior to transport to minimize the dispersal of excavated soils through airborne emission or spillage. Truck liners shall be used if free water is present in the excavated material or if soils are flowable. Spillage that occurs on public roads shall be cleaned and removed as quickly as possible by picking it up or by brushing it into an area that is planned for cleanup, but has not yet been cleaned up.

- C. Follow the requirements of the Transportation and Disposal Plan in all loading, hauling and disposal operations, for disposal at a MSW landfill(s) or the Globe Plant.

3.11 BACKFILL AND GRADING

- A. Each residential yard remediated shall be backfilled to the approximate original grade with approved clean replacement soil. Place a minimum of 12 inches of soil in excavated yard, flowerbeds, and vegetable gardens, where required. Overfill flowerbeds and gardens as directed by Supervising Contractor to compensate for settling. Perform hand work for the fine grading as necessary to achieve pre-removal grades and promote drainage away from houses. Fine grading shall include allowance for vegetation installation, as necessary, and shall provide a top elevation approximately 1 to 1 ½ inches below tops of drainage inlets, as necessary.
- B. Gravel driveways, parking areas, and other residential areas subject to vehicular traffic shall be backfilled to approximate original grade with a minimum of 8 inches of compacted soil followed by 4 inches of clean gravel.
- C. Where access allows, the trucks may drive onto the yard or road and deposit their load while driving slowly to spread the material. Where access is limited, the trucks shall dump their load at a staging area adjacent to the yard from which equipment can transport the material around the yard. Some handwork using wheelbarrows and shovels may be necessary to rough grade the yards. Rough grading of areas requiring gravel (e.g., driveway, roads, and road shoulders) shall be performed using the same methods.

3.12 COMPACTION

- A. Compaction of the residential backfill material shall be accomplished using plate compactors, hand tamping or other measures approved by the supervising contractor. Compaction shall be performed as directed by the Supervising Contractor. Further compaction of backfill material may be required in areas where walkways and egress/ingress will occur.
- B. Compact gravel surfacing with plate compactor or equipment travel as directed. At a minimum, gravel surfacing shall be placed and compacted to pre-removal conditions, and to promote drainage as necessary.

3.13 Post-Construction Photodocumentation

- A. The Construction Contractor shall thoroughly document the condition of each remediated property at the end of the maintenance period, and shall provide such documentation to the Supervising Contractor within one week after the maintenance period expires.

3.14 REPAIR ACTIVITIES

- A. Soil removal and replacement activities shall be conducted to minimize damage to property, to the extent possible. Any damaged structures (e.g., buildings, sidewalks, fences, etc.) shall be repaired or replaced at Contractor's cost upon discovery and determination that the damage was caused by remediation efforts. Landscape features (trees, shrubs, etc.) damaged during the removal and replacement procedure shall be repaired or replaced to equal or better conditions.
- B. Damaged utilities (including water, electric, gas, telephone and cable) shall be repaired or replaced to current building code requirements.
- C. If doubt exists whether damage was caused during the soil removal process, video and/or photographic documentation taken before initiation of activities shall be reviewed on a case-by case basis. The decision to repair dispute damages shall be made by the Supervising Contractor. Once any necessary repair work has been completed additional photographs and/or videos will be taken to document the final condition of each remediated property.

3.15 ADDITIONAL WORK

- A. Additional work may be performed at the properties beyond restoration to pre-removal conditions, at the request of property owners and as approved by USEPA such that the remediation schedule is not impacted.
- B. USEPA approved additional work, beyond pre-removal restoration, will be at the expense of the property owner.

END OF SECTION

SECTION 02900
VEGETATION ESTABLISHMENT – TREES AND SHRUBS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section describes the requirements for tree and shrub establishment in the Residential Yard work areas.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 02205 – Yard Remediation Earthwork
- C. Section 02920 – Vegetation Establishment – Sod Installation

1.3 QUALITY CONTROL

- A. Growth medium shall comply with Specification Section 02205, Part 2.1. The Supervising Contractor shall have the right to sample the growth medium material and conduct confirmatory analyses, prior to acceptance of the material, and periodically during placement of growth medium.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver compost and other accessories in containers recommended by the manufacturer(s) and store as directed. Protect synthetic erosion control materials prior to installation as recommended by the manufacturer.

1.5 SUBMITTALS

- A. Submit information on proposed material supplier(s) at least 5 days prior to delivery.

PART 2 PRODUCTS

2.1 ACCESSORIES

- A. Mulching Material: Dry oat or wheat straw, free from weeds and foreign matter detrimental to plant life. Chopped cornstalks are acceptable. Also acceptable is approved wood cellulose fiber; chip form and free of ingredients that could inhibit growth or germination. Use all certified weed-free material.

2.2 COMPOST

- A. "EKO" compost as provided by Pioneer Sand and Gravel, or equal, shall be aged organic matter meeting the following minimum requirements.

1. Minimum Requirements

- a. Organic matter: 45% minimum
- b. Specific conductivity: 4.0 mmhos/cm maximum
- c. PH range 4.3 to 7.5

Sphagnum peat shall contain at least 95 percent organic matter determined on an oven-dry basis and shall have a pH of 4 to 6.5. Ground native mountain peat may not be used unless otherwise approved by the Supervising Contractor. If approved, native mountain peat shall be furnished in bulk, shall contain at least 50 percent organic matter determined on an oven-dry basis, and shall have a pH of 6.5 or less.

2. Organic material may be:

- a. Dried, pulverized poultry manure.
- b. Humus
- c. Compost.
- d. Aged, treated, pulverized manure.
- e. Treated sewage sludge.

3. Aspen humus may not be used as a soil amendment.

4. Mountain peat may not be used as a soil amendment on properties owned by the City and County of Denver

5. If peat is used, it will be thoroughly mixed into the soil.

2.3 TREES AND SHRUBS

- A. General. Where tree or shrub replacement is required, plants shall be of the species or variety designated, in healthy condition with normal, well-developed branch and root systems, and shall conform to the requirements of the current "American Standard for Nursery Stock" (American National Standard Institute ANSI Z60.1-1980). The Contractor shall obtain certificates of inspection of plant materials that are required by Federal, State, or local laws, and submit the certificates to the Supervising Contractor.

1. All plants shall be free of plant diseases and insect pests. All shipments of plants shall comply with all nursery inspection and plant quarantine regulations of the State of origin and destination, and the Federal regulations governing interstate movement of nursery stock.

2. The minimum acceptable sizes of all plants, measured before pruning, with branches in normal position, shall conform to the measurements specified on the red-lined design drawings signed by the property owner.
 3. Plants hardy in hardiness zones 2,3,4 and 5, as defined in U.S. Department of Agriculture publications, only shall be accepted.
 4. All nursery grown plants shall be those plants that have been growing in a nursery for at least one growing season, or plants that have established themselves in accordance with definitions set forth in the Colorado Nursery Act, Title 35, Article 26, CRS.
 5. Trees and shrubs shall have been root-pruned during their growing period in a nursery in accordance with standard nursery practice.
- B. Not Recommended Trees. Trees with excessive fruit or flowers such as western catalpa, tree of heaven, Kentucky coffee tree, and cotton-bearing may create a maintenance problem or pedestrian hazard and should not be planted within public right of way. Trees with marginal success in this area, such as Ohio buckeye, sycamore, and pin oak, should not be planted within public right of way.
- C. Prohibited Trees. Unless specifically authorized by the Denver City Forester, the following species of trees are prohibited from being planted within right of way belonging to the City and County of Denver.
1. Any of the poplar species (*Populus* sp.)
 2. Any of the willow species (*Salix* sp.)
 3. The box elder tree (*Acer negundo*)
 4. The Siberian (Chinese) elm (*Ulmus pumila*)
 5. The silver maple (*Acer saccharinum*)
 6. Any weeping or pendulous type of tree.
 7. Any tree with bushy growth habit which cannot be maintained to a single leader or trunk.
 8. Any shrub which could obstruct, restrict, or conflict with the safe use of the right of way.
 9. Any artificial trees, shrubs, turf or plants.
- D. Substitution. In the event that plants of acceptable quality and the specified variety or size are not available locally, the contractor shall notify the property owner and request that the property owner suggest acceptable alternatives such as:
1. Replacement with acceptable plants that are larger than specified,
 2. Replacement with smaller plants,
 3. Replacement during the following planting season with plants that are not available in the trade in suitable sizes this season,

4. Replacement with plants of a different genus, species, or variety.
5. Replacement with any additional quantity of plants if smaller than the existing size.

The contractor shall notify the Supervising Contractor of tree, shrub or flower substitution.

- E. Handling and Shipping. Plants shall be dug, properly pruned, and prepared for shipping in accordance with recognized standard practice. The root system shall be kept moist and the plants shall be protected from adverse conditions due to climate and transportation, between the time they are dug and actual planting. Deciduous plants may be furnished bare root, balled and burlapped, or in containers used in standard nursery practice. Balling and burlapping shall conform to the recommended specifications in the "American Standard for Nursery Stock". The call of the plant shall be natural, not made, and the plant shall be handled by the ball at all times.

2.4 WATER

- A. Water used for irrigating newly-seeded lawns shall be free from oil, salt and other contaminants and shall be free from excessive suspended sediment and debris.

3.1 TREE AND SHRUB PLANTING

- A. If required, plant trees and shrubs in suitably-excavated areas with placement, fertilization, backfill, mulching, and watering as recommended by the nursery for the tree or shrub being planted.

END OF SECTION

SECTION 02920
VEGETATION ESTABLISHMENT – SOD INSTALLATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section describes the requirements for sod installation during Residential Yard remediation.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 02205 – Yard Remediation Earthwork
- C. Section 02900 – Vegetation Establishment - Seeding

1.3 QUALITY CONTROL

- A. Soil material shall comply with the requirements of specification Section 02205.
- B. Contractor shall provide sod on pallets or in rolls, with roots protected from dehydration until the time of installation. Sod shall be identified clearly with source location, grass species, age and date/time of harvest from source.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 18 hours of delivery.

1.5 SUBMITTALS

- A. Submit sod certification for grass species and location of sod source.

1.6 MAINTENANCE SERVICE FOR SODDED AREAS

- A. Maintain sodded areas immediately after placement for 30 days to ensure grass is well established and exhibits a vigorous growing condition.
- B. Immediately replace sod in areas which show deterioration or bare spots.
- C. Replace or repair any damaged lawn irrigation component (e.g., sprinklers, pipes) to ensure a working system upon completion of sod installation.

PART 2 PRODUCTS

2.1 SOD SUPPLIER

- A. Sod producer must be company specializing in sod production and harvesting with a minimum of five (5) years experience, and certified by the State of Colorado.

2.2 SOD CHARACTERISTICS

- A. Sod shall have a minimum age of 18 months, with root development that will support its own weight, without tearing, when suspended vertically be holding the upper two corners and shall have a soil thickness of $\frac{3}{4}$ - inch, minimum to 1 $\frac{1}{2}$ -inch, maximum.
- B. Sod shall be ASPA approved or certified and may be field grown, with a strong fibrous root system, free of stones, burned or bare spots and shall be 99 percent weed free. The one percent allowable weeds shall not include any undesirable perennial or annual grasses or plants described as noxious by current State statute or regulation. (The "Colorado Undesirable Plant Management Act" Title 35, Article 5.5, CRS, defines the following four plants as "noxious": Leafy Spurge, Difuse Knapweed, Russian Knapweed, and spotted Knapweed. The counties are responsible for enforcing the Undesirable Plant Management Act and may have declared other plants, such as Purple Loosestrife, to be "noxious".
- C. Sod shall consist of species appropriate to growing conditions in local areas and may include the following:

Baron	Nassau	Nugget
Fylking	Touchdown	America
Majestic	Parade	A-34
Ram 1	Glade	Adelphi
Midnight	Columbia	

Other sod types may be used if approved by the Supervising Contractor.

- D. Sod shall be harvested from the field source area by machine cutting in accordance with ASPA guidelines in minimum widths of 18 inches and minimum lengths of 48 inches.

2.3 ACCESSORIES

- A. Wood pegs made of softwood, with sufficient size and length to ensure anchorage of sod on steep slopes, as necessary.
- B. Edging shall be made of galvanized steel or plastic consistent with original material.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that prepared soil base is ready to receive the work of this section. The upper 4 inches of soil shall be free from rocks and debris, shall be rototilled and fine graded to ½ inch below adjacent walks, driveways and patios.
- B. Beginning of installation means acceptance of existing site conditions.

3.2 LAYING SOD

- A. Place 200 pounds per acre of 18-46-0 fertilizer or starter commercial seed fertilizer and moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately on delivery to site, and within 24 hours after harvesting, to prevent deterioration.
- C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces. No gaps greater than 1 inch shall exist between sod and adjoining fixed features.
- D. Lay sod in smooth sections. Place top elevation of sod even with adjoining edging, paving, or curbs. Where sod abuts drainage inlets, adjust subgrade soils such that the top of the sod will be 1 ½ inches below the top of the drainage inlet.
- E. On slopes 2:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of 2 feet on center. Drive pegs flush with soil portion of sod.
- F. Water sodded areas immediately after installation. In accordance with Denver Water requirements. Unless otherwise specified, saturate sod to 4 inches of soil depth.
- G. After sod and soil have dried, roll sodded areas with an approximately 150 pound roller to ensure good bond between sod and soil and to remove minor depressions and irregularities.

- H. If sod manufacturer recommends application of fertilizer to installed sod, apply at the recommended rate.
- I. Install sod between April 1 and August 31 each year.

3.3 MAINTENANCE

- A. Maintain and water sodded areas for a period of 30 days following installation.
- B. Immediately replace sod in areas which show deterioration or bare spots.
- C. After the initial watering at installation, apply approximately 1 inch of water to sod every third day until end of maintenance period, or as recommended by the sod manufacturer. Account for natural precipitation in water applications using neighborhood rain gauges.

END OF SECTION